SEE IT HERE FIRST! SUPER-REAL FLIGHT SIM p. 182

HUGE ISSUE!

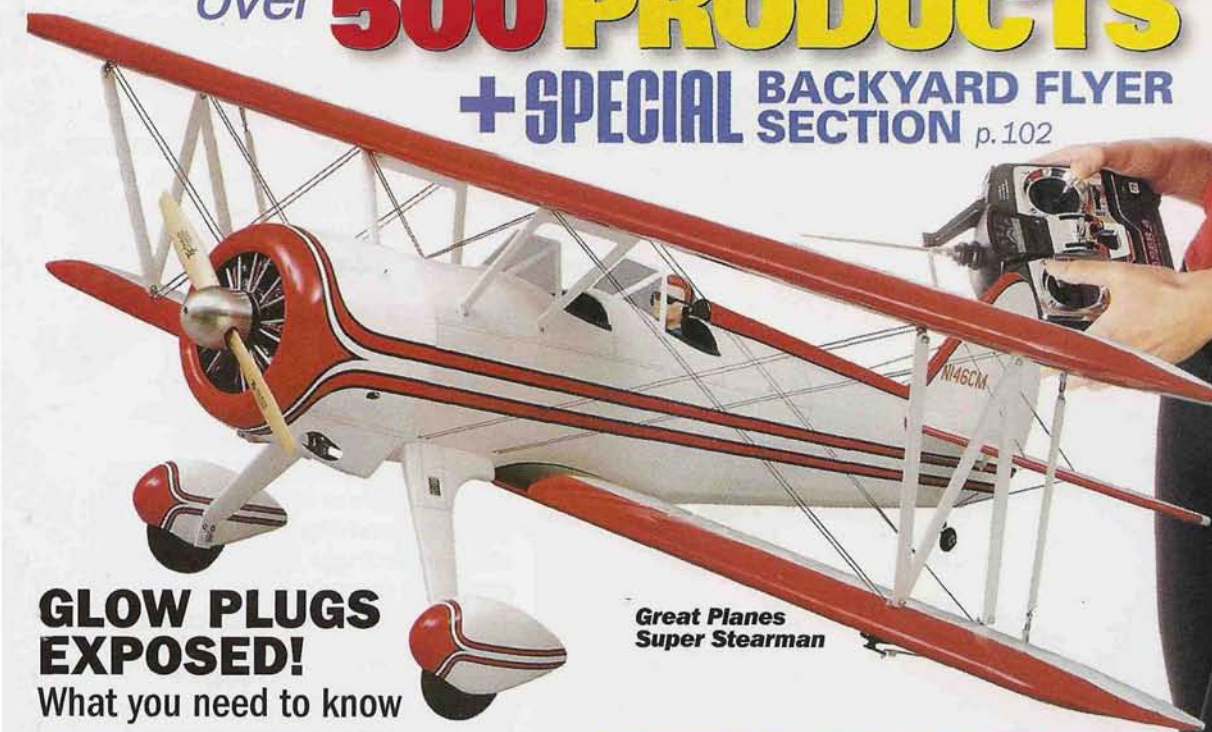
MODEL Airplane NEWS

75th ANNIVERSARY 1929-2004

2004 BUYERS' GUIDE

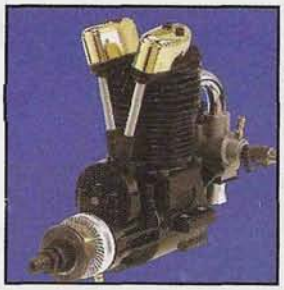
over 500 PRODUCTS

+SPECIAL BACKYARD FLYER SECTION p. 102



Great Planes Super Stearman

GLOW PLUGS EXPOSED!
What you need to know



RCX

THE HOTTEST RC SHOW OF THE YEAR!
P. 76

WE TEST

Top Flite **T-34B Mentor** › Gold Edition kit
WattAge **Mad Dog** › Electric sport performer
VMAR **Sport Hornet** › Full-house trainer
Seagull Model **Spacewalker** › Sunday flyer
Futaba **T7CAP** radio › The best for less

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MODEL Airplane NEWS

AUGUST 2004, VOLUME 132, NUMBER 8

FEATURES

FLIGHT TESTS

CONSTRUCTION

***ON THE COVER:** the Great Planes Super Stearman is just one of the hundreds of planes listed in our special "Model Airplane News Buyers' Guide" section. You'll also find information and prices on other hot products, such as the Saito Golden Knight 4-stroke engine, Futaba T7CAP radio, MS Composit Hornet heli and MRC 969 Super Brain battery charger (insets). ON THIS PAGE: at this year's Top Gun, Bryce Watson flew his turbine powered F-5 Tiger to 11th place in Pro/Am. The 1/6-scale jet also won the Best Pro/Am Aircraft award. (Photo by Debra Cleghorn.)*

SPECIAL SECTION >>
Buyers' Guide 83

COLUMNS

DEPARTMENTS

EDITORIAL

BY DEBRA CLEGHORN

RCX ACTION-PACKED

If you were one of the thousands of RC'ers who came to our RCX show in Anaheim, CA, this April, you already know what I mean when I say "RC rocks!" A collaboration between Vision Entertainment and Air Age Media, publisher of *Model Airplane News* and *Backyard Flyer*, RCX was the place to be as enthusiasts poured in to take a look at the latest RC planes, boats and cars in action. Electric-plane frontrunners like GWS, Hacker and Global Hobby brought in some of the best pilots in the world to showcase the latest flyers in two huge flight zones, while RC car drivers wowed the crowd in the nearby dirt and stunt tracks. In an enormous pond, gas-burning powerboats as well as smaller sport and scale watercraft made waves and sprayed rooster-tails. Don't miss our special RCX coverage on page 76, and be sure to mark your calendar for next year's excitement on May 20 through 22. And if you live in the central U.S., don't despair; RCX will be coming to Chicago, IL, in the summer of 2005 as well!

With more than 500 product listings at your fingertips, the *Model Airplane News* Buyers' Guide in this issue is your resource for everything RC: sport planes, backyard flyers, kits, radios, gear, engines, accessories ... you name it, you'll see it here. The listings are organized in product categories, so it's easy to find exactly what you're looking for, and manufacturer information is included. This special section starts on page 83. Enjoy!

We're also excited to offer two first looks at some innovative products: MRC's new Reflex XTR flight simulator and Futaba's new T7CAP radio. The Reflex is one of the first flight sims we've seen that features expanded 3D flight training, and on page 182, our West Coast associate editor John Reid shares an inside look at this new program. Futaba's latest radio is an affordable 7-channel unit that offers really high-end features; see associate editor Rick Bell's in-depth review on page 192.

Glow plugs may be among the most mysterious components of your engine: they don't look like much, but they are critical to good performance. In the first of a two-part series, engine guru Dave Gierke examines this important piece of equipment and sheds light on how glow plugs keep your engine running smoothly. This month, he also explains the differences between long- and short-reach plugs and notes when—and why—you might need a special idle-bar or Nelson-type glow plug. Stay tuned for the next issue in which Dave details how to choose the correct glow plug for your engine and how you can "read" it to troubleshoot engine problems. See you then!

Debra Cleghorn

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WRITE TO US! We welcome your comments and suggestions. Letters should be addressed to "Airwaves," *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA; email man@airage.com. Letters may be edited for clarity and brevity. We regret that, owing to the tremendous numbers of letters we receive, we cannot respond to every one.

BENT-WING WARBIRD

I was pleased to see your review of the Hangar 9 Corsair in the July 2004 issue of *Model Airplane News*. I have a Saito .91 4-stroke engine that would be a perfect match for the .60-size South Pacific warbird. Given its bent-wing shape, is there anything unusual about how this fighter flies? I have often wondered why it wasn't designed with normal straight wings such as those on the P-40 and P-51 Mustang. What's the story?

Frederick Hoffman
Los Angeles, CA

Frederick, the Hangar 9 Corsair is indeed a great flying model. Powered by a .91 4-stroke, it would be a winner for sure. As long as you keep the model's CG balance point where it should be, you won't find any gremlins while flying the Corsair. As it's a sport-scale fighter, I wouldn't recommend it as a first or second model, but if you can pilot a sport, low-wing model equipped with ailerons, you'll be fine!

Developed during WW II, the Corsair was intended to be a carrier-based Naval fighter. Because it was used by both the Navy and the Marines, it had to be rugged to survive repeated carrier landings. One way to keep the landing gear strong was to make them as short as possible while maintaining a safe prop-tip-to-ground clearance. Bending the wings into the well-known inverted-gull shape was the answer—an excellent example of form following function. Have fun with your bent-wing warbird! GY

WHAT'S CAD?

I just finished reading Gerry Yarrish's article on the *Model Airplane News* website about painting custom markings (modelairplanenews.com/how_to/custom_markings1.asp). In his article, Gerry says that he drew the letters and numbers using a CAD program. I am familiar with the term CAD, but he doesn't explain which CAD program he used or the programs that are available. Since I'm unfamiliar with the programs, can anyone help? Thanks!

Walter E. Seymour [email]

Walter, computer-aided-design (CAD) programs are very much a part of modern-day modeling. CAD can be used to design and manufacture model airplanes and accessories, and it enables hobbyists to draw their own scale 3-views. It saves time and effort, too. In a nutshell, CAD is a very accurate drawing program in which you use a keyboard and a mouse instead of paper and pencil. When the drawing is complete, you save it in an

electronic file. You can send it to a manufacturer who can use the file to laser-cut wood parts, or you can print reduced-size drawings on an ordinary inkjet printer. The plans can also be produced full-size using a plotter of the appropriate size and width. Full-size drawings can also be produced by a desktop printer, but the many small pages must be taped together to produce the complete drawing.

To produce the numbers and letters that I used in my article, I first scanned in the 3-view drawings and then, using the CAD program, I traced and cleaned up the specific markings I wanted. I then sized them to ¼ scale and printed them out on my home inkjet printer. These became my templates for making the painting masks.

There are several CAD programs available, and some can even be downloaded free from the Internet. I use an old program called "DrawingBoard." It's no longer available because it has been replaced by a pricier version called "Vellum"; check it out at ashlar.com. A more affordable CAD program intended for use by modelers is "ModelCAD." It's available from Upperspace.com, and you can see it at upperspace.com/products/1019 or call the company at (800) 233-3223. I can't explain how to use CAD programs here, but once you have learned them, a whole new world of model design and drawing will be open to you. Here are the computer requirements for ModelCAD: Microsoft Windows 9x or NT (version 4.0 or later); a 486DX processor with 16 MB of RAM; a SuperVGA graphics card capable of 256 or more colors; and a SuperVGA monitor capable of at least 800x600 dpi (dots per inch) resolution. Hope this helps! GY

FIRST GEE BEE

Model Airplane News never ceases to amaze me; I learn something new from every issue. In the June 2004 issue, you featured a construction article on the Gee Bee Model-A by "Mr. Gee Bee" himself: Henry Haffke. Over the years, I have read dozens of Henry's Gee Bee features and construction articles and thought I knew just about all there was to know about the Granville brothers' aircraft, but I didn't realize they had developed a biplane. The history lesson on page 79 with the old photos of the full-size aircraft was the icing on the cake! I ordered a set of plans and intend to enlarge the model a bit so I can power it with my new Zenoah G-26. Again, keep the interesting and unusual construction articles coming! Henry is a modeling gem, and we're all richer for his model designs.

Harry Chaplin
Kokomo, IN

Harry, many thanks for your kind words regarding the magazine and Henry Haffke's contributions. We consider ourselves very lucky to have worked so closely with Henry over the years. We were equally surprised to learn that the first Granville brothers' aircraft was a biplane. If you are ever in the greater Hartford, CT, area, drop by the New England Air Museum in Windsor Locks; there's a Model-A on display in its collection of rare aircraft. You can see a photo of the Gee Bee Model-A on the museum's website: neam.org/images/geebeeA_lg.jpg. Good luck with your enlarged version of Henry's design. GY

TIPS & TRICKS

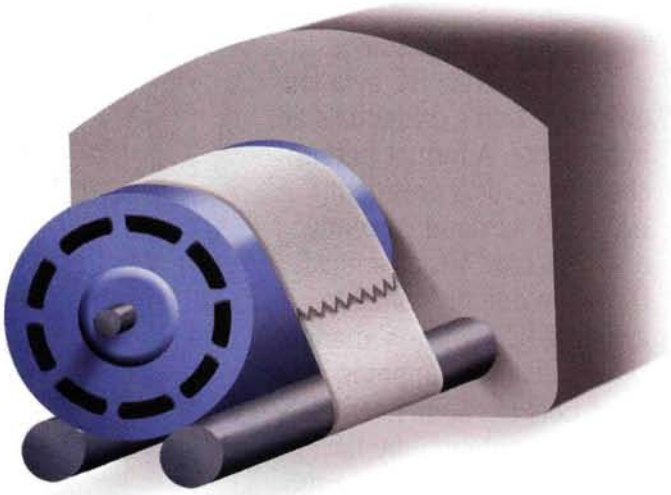
Illustrations by Richard Thompson

SEND IN YOUR IDEAS. *Model Airplane News* will give a free, one-year subscription (or a one-year renewal, if you already subscribe) for each idea used in "Tips & Tricks." Send a rough sketch to *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA. BE SURE THAT YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we can neither acknowledge each one nor return unused material.

magnetic personality

How many times have you been frustrated while trying to place mounting screws or bolts with washers in hard-to-reach areas, only to have them fall off your driver? A solution is to place a small, rare-earth magnet on the shaft of the screwdriver or hex wrench. Place the bolt or screw with washers on the driver, and they'll stick in place. The closer the magnet is to the tip of the driver, the better the screw will hold its position.

Bruce Taylor, Shasta Lake, CA



easy motor mount

Here is a simple method to mount small motors and prevent damage to them in the event of a crash. Install two dowels through the firewall and into the first bulkhead of your model, and glue them into place. Wrap masking tape around the motor a couple of times to hold it securely on the dowels. Now, if you happen to hit the nose of your model on the ground, the tape will tear and absorb some of the crash energy. The tape will hold power systems as large as direct-drive Speed 400s.

Barry Terrell, Houston, TX

gutter gear

You can use a slice from a PVC rain gutter to make a durable, flexible and lightweight landing gear for small models and park flyers. After you cut the piece from the gutter, lightly sand the edges to smooth them, and then drill holes for the axles. The "gear" can be cut to any width and will support models that weigh up to 3 pounds.

Will Hundley, Osburn, ID

a new angle

Precisely setting control throws on your model can be difficult. Here's a device that makes this job very easy. Pick up a double-arm protractor made by Hempe at your local hardware store; it costs about $6. Set the desired angle (for example, 35 degrees) on the protractor, and then place it on the wing or stabilizer. Move the control surface to meet the angle you set on the protractor, and adjust the radio as necessary. What could be easier?

Gary Ritchie, Olympia, WA

PILOT PROJECTS

SEND IN YOUR SNAPSHOTS. *Model Airplane News* is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable, but please do not send digital printouts or Polaroid prints. Emailed submissions must be at least 300dpi. We receive so many photographs that we are unable to return them. All photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of the year. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in! Send those pictures to "Pilot Projects," *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA.

The Robin

John Tolmie

Auckland, New Zealand

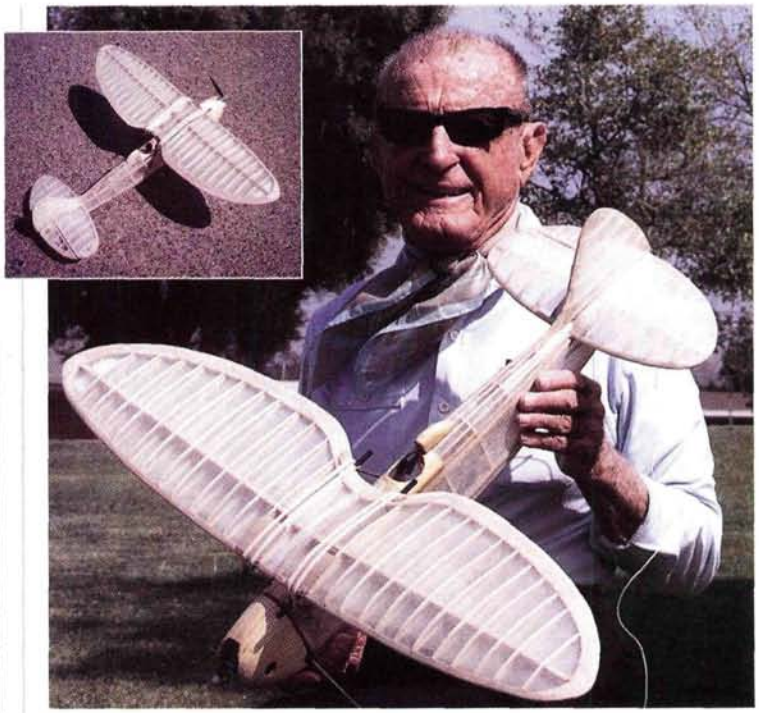
Talk about a cool-looking bird! Inspired by the May 2000 issue of *Model Airplane News*, John created The Robin from an Andy Lennon plan. The model features slotted flaps, NASA leading-edge droops and mass-balanced control surfaces. John fitted in an O.S. .46 FX engine with a J'Tec in-cowl muffler. But what about that sleek finish? Andy covered his plane with a mixture of MonoKote and Oracover and decorated the surface with a combination of Solartrim and Trimkote. Good work!

Savoia-Marchetti S79

Ty Brown

Kannapolis, NC

Designed from a 3-view, this Italian torpedo bomber is quite a sight! Fully equipped with flaps and functional torpedo drops, the S79 has a 110-inch wingspan and weighs 22 pounds. This powerful plane holds two Magnum .61 4-stroke engines and an O.S. .91 4-stroke. With all three engines running at once, Ty's bomber gets 21 pounds of pull with its 3-blade props. The wing and fuselage are built up and fiberglassed with ¾-ounce cloth, and the rear of the fuselage is all Coverite. Ty also created an attractive finish with latex paints and clear polyurethane. Right on target, Ty!



Tornado

Col. Robert E. Thacker

San Clemente, CA

No need to hide from this Tornado! Created from balsa, Col. Thacker's Tornado weighs only 20 ounces and has a wingspan of 30 inches. He used a Norvel .061 engine with a 6x3 prop and his trusty Airtronics Stylus radio. As you can see, the beautiful finish was created from Coverite's Micafilm and finished with a clear coat of polyurethane. How does it fly? The colonel says "... It has just been a delight for an old guy to build an old-timer like this and have it fly so well." It may not be the B-17, B-29, or P-80 you used to fly in the USAF, but it's a terrific model, Colonel.

Winglet

Tim Young

Blountville, TN

After seeing the Winglet in the March 1994 issue of *Model Airplane News*, Tim decided to build this plane with some personal modifications. He enlarged several bays in the wing's center and extended the wingspan to 85 inches, thereby making it IMAA-legal. He also installed retracts to clean up the flight lines. To compensate for the model's extra weight, he increased the engine size to an O.S. .61 FX. After finishing the plane in just two months, Tim found that the 8-pound, 2-ounce Winglet "... flies like a monster Zagi ... very low and very fast!"

Combat Models A-10

Brian Bissell

Lancaster, KS

Ready for battle, this A-10 is powered by a YS .45 engine and weighs 7¾ pounds. Brian constructed his model out of Styrofoam and used epoxy/glass for the finish. He also used Robart retracts and struts on this intimidating-looking model. Nicely done! Thanks for the great picture, Brian.

Sig Piper Cub

Paul Tomaszewski

Sunnyvale, CA

No; you are not seeing double! Paul has constructed a ¼-scale, 105-inch Piper Cub that's modeled after Ron Willcher's 1946 full-size Piper Cub Special. Powered by an ASP .91 engine with an O.S. carburetor and 14x6 prop, this 14½-pound Cub was meticulously constructed over an 18-month period. The effort certainly was worth it, since Paul tells us, "The ship flew like a dream on its maiden flight." We can't wait to see his next one!

Heinkel 100

John G. Giles

Oklahoma City, OK

Check this one out! John's attractive, scratch-built Heinkel 100 has an 80-inch wingspan and weighs 13¾ pounds. Powered by a Saito 1.80 engine and a 17x8 APC prop, this model is quite an achievement. John says that his Heinkel "... takes off like a typical warbird, but once in the air, it's very smooth." Congratulations on a job well done!

Amalgamation One

Robert A. Haas

Killeen, TX

With a wingspan of 72 inches, the 57-inch-long, 8-pound Amalgamation One is a handsome scratch-built model that Robert describes as "quick and aerobatic." This eye-catching original design is powered by a Fox .74 BB/RC with an 11x8 Zinger prop and a Snuffler Muffler. With its sharp color and sleek surface, the Amalgamation One is quite a cool-looking plane. Great job!

AIR SCOOP

by the Model Airplane News *crew*

NEW PRODUCTS hit the model airplane market all the time, so here's the inside source for what's hot and where you can get it. For every issue, we sift through product announcements, show reports, rumors and prototypes to let you in on the best and the latest. Remember, you saw it here first!

EXCELLERON 50 AND 90 ARFS

SPORTSMAN AVIATION

These sharp-looking pattern planes feature balsa and light-plywood construction with iron-on covering. Each kit includes a high-quality hardware package and shock-absorbing main landing gear with easy and fast assembly. Specs (Excelleron 50/Excelleron 90): wingspan—58/66.5 in.; wing area—665/865 sq. in.; weight—5.5 to 6/8 to 8.5 lb.; wing loading—19 to 21/20 to 22 oz./sq. ft.; length 57/67.5 in.; engine—.46 to .52/.91 to 1.10 2-stroke, or a .70 to .80/.91 to 1.20 4-stroke; price—$239.99/$279.99.

Sportsman Aviation; distributed by Global Hobby Distributors (714) 963-0329; globalhobby.com.

MODEL TECH

SE5a SCOUT ARF

Here's a vintage aircraft that you'll want to own: the new SE5a Scout ARF from Model Tech. This new kit features balsa and light plywood construction finished with iron-on covering. A scale main landing gear and wire spoke wheels along with a complete hardware package are also included. Specs: wingspan—49.5 in. (top and bottom); wing area—792 sq. in.; weight—5.5 to 6.5 lb.; wing loading—16 to 19 oz./sq. ft.; length—41 in.; engine .40 to .52 2-stroke or .52 to .61 4-stroke; price $189.99.

Model Tech; distributed by Global Hobby Distributors (714) 963-0329; globalhobby.com.

HITEC RCD

OPTIC 6

Packed with features, this new 6-channel radio from Hitec is available with airplane, sailplane and helicopter programming and an 8-model memory. It also has features such as assignable switches, dual rates, expo, fail-safe, frequency shift select, throttle lock, dual timer and two slider switches, just to name a few.

And the best part? It's available with Spectra synthesized capability, so you can fly with any FM or PCM receiver. We can't wait to get our hands on this one!

Hitec RCD (858) 748-6948; hitecrcd.com.

FLYZONE BY HOBBICO

MICRO ULTRIX

Learning to fly has never been easier—or less expensive! Check out this latest backyard flyer from FlyZone! The 15.75-inch-span plane comes completely assembled with 2-channel radio, battery and charger. Twin differential-thrust electric motors and straightforward stick control accelerate the learning process. A single charge from the handy, included field charger provides enough power for 4 to 5 minutes of flying. The price tag? Less than $50!

FlyZone by Hobbico; distributed by Great Planes Model Distributors (217) 398-6300; (800) 682-8948; hobbico.com.

GREAT PLANES MODEL MFG.

Fling ARF Sailplane

Catch the smallest thermals with this ARF sailplane. Its high-quality construction includes a fiberglass fuselage pod, carbon-fiber boom and balsa wing and tail that come covered. An installed servo tray makes installing 2 microservos a breeze, and a molded fiberglass canopy allows easy access to the onboard gear. An included mini high-start will get the Fling to altitude in a flash. Specs: wingspan—48.75 in.; wing area—284.5 sq. in; weight—6.8 oz.; length—31.5 in.; requires 2- to 3-channel radio. The Fling retails for $89.99.
Great Planes Model Mfg. (217) 398-6300; (800) 682-8948; greatplanes.com.

DYMOND MODELSPORTS USA LTD.

LIPO ADVANTAGE BRUSHED SPEED CONTROLLERS

Dymond Modelsports now carries a line of adjustable speed controllers for use with brushed motors and Ni-Cd, NiMH and Li-poly batteries. By pressing a button on the speed controller, you can adjust for four modes. Modes 1 and 2 include brake, no brake and low-voltage cutoff and are for use with Ni-Cd and NiMH batteries. Modes 3 and 4 include brake, no brake and the automatic detection of cells for Li-poly batteries. Low-voltage cutoff can be deactivated in all modes. These controllers can handle 6 to 12 Ni-Cd and NiMH cells and 2 to 4 Li-poly cells. Prices—$29.95 (Advantage 24A), $39.95 (Advantage 36A), $54.95 (Advantage 55).
Dymond Modelsports (858) 495-0092; rc-dymond.com.

PM MODELS

Phantom II

This 106-inch model offers great flight characteristics in an easy-to-build package. Powered by a 1.60 2-stroke, it has plenty of power yet can float in for landing. The Phantom II is 68.25 inches long and comes with all hardware, canopy and cut ribs. The kit costs $199.95.
PM Models (760) 947-4381.

MULTIPLEX USA

MAGISTER

Made completely out of Elapor foam, this easy-to-assemble trainer is designed to survive the bumps and bruises of those first flights! It can be powered by a .25 to .40 engine or an electric motor, and it's also available ready to fly with a complete Permax 680 geared motor and ESC and Laser 4 radio system. Specs: wingspan—64.2 in.; length—46 in.; weight—68.7 oz. (glow)/84 oz. (electric).
Multiplex USA; distributed by Hitec RCD (858) 748-6948; multiplexusa.com.

BALSA USA
415-D ERCOUPE

This ⅓-scale 1937 Ercoupe 415-D all-wood kit features balsa, basswood and ply construction, "fall-out" die-cut parts, plug-in wing panels, scale rib placement, scale sliding side windows, a formed windshield, scale cast-aluminum landing gear and steerable nose gear with functional Oleo struts. The kit also includes a fiberglass cowl, seven sheets of full-size rolled plans, a cockpit interior kit, hardware, a scale decal set and scale features and fittings. Priced under $900, the 120-inch Ercoupe weighs 28 to 32 pounds and is ideal for 45- to 55cc gas engines and 3 to 3.5ci glow engines.

Balsa USA (800) 225-7287; balsausa.com.

HANGAR 9
FuntanaS 90 3D ARF

Tournament of Champions ace Sebastiano Silvestri knows what it takes to be a top aerobatic performer. His KatanaS is famous for its TOC exploits, and now that design has inspired this gorgeous 69.5-inch ARF. Built to accept a .60 to 1.0ci 2-stroke and a .90 to 1.00 4-stroke, it is a larger version of the popular .40 FuntanaS. And like the TOC competitor and its little brother, the FuntanaS 90 can do just about any 3D aerobatic maneuver you can think of. Details like larger control surfaces, wing fillets and lighter wing loading all add up to an exceptionally capable performer.

Hangar 9; distributed by Horizon Hobby Inc. (800) 338-4639; horizonhobby.com.

JMD MODELS
Globe Swift

This classic and beautiful airplane from the past has been brought into the present as a very easy-to-build, 36-inch-span park flyer. The kit features a fiberglass fuselage, all laser-cut wood parts, aluminum landing gear (with retracts), Du-Bro hardware, GWS motor drive system and propeller. It requires a 4-channel radio system and costs $124.95.

JMD Models; jmdmodels.com.

SIG MFG.
Little Extra ARF

Designed by Tom Herr, the Little Extra ARF is a glow-powered park flyer with super-snappy aerobatic performance. With a 36.5-inch span, the model is hand-crafted of select balsa and plywood and comes covered with Oracover. A complete hardware package with fuel tank, motor mount, aluminum landing gear, tailwheel assembly and control linkage is included.

Herr Engineering; distributed by Sig Mfg. (641) 623-5154; sigmfg.com.

HIROBO
VERTOL UPDATE

A favorite for many years, the Vertol has recently been improved in many ways. Gone is the complicated mechanical control system; instead, a Hirobo-designed mixer (included with the kit) now mixes the controls electronically. A three-axis gyro is also included. The Vertol is available with the familiar CH-46 body and the CH-47 Chinook. Specs: main rotor diameter—41 in.; length—38 in.; weight–10.5 lb.; engine req'd—.50 2-stroke heli; price—$2,300.

Hirobo; distributed by MRC (732) 225-2100; modelrectifier.com.

TOP FLITE

T-34B

Tandem warbird trainer

The T-34 Mentor is the military version of Beechcraft's popular civilian aircraft, the Model 35 Bonanza. In anticipation of the U.S. Air Force's great need for trainers for jet pilots, the first T-34 was built in 1948, but USAF officials were torn between two training methods: whether to use a piston-powered plane, such as the Beechcraft, as a transitional trainer or simply to train pilots in existing jets. At last, a decision was made in favor of the Beechcraft, and in 1954, the Air Force—and, shortly thereafter, the U.S. Navy—adopted the military version of the Bonanza and renamed it the "Model 45 T-34 Mentor." More than 100 of these planes are still flying today, and the T-34 has a loyal following among warbird owners and operators worldwide.

Mentor GOLD EDITION

BY BOBBY CORBETT

The cockpit interior (sold separately) offered by Top Flite really adds to the T-34B's detail and scale looks, and the instruction manual even tells you how to install it.

THE KIT

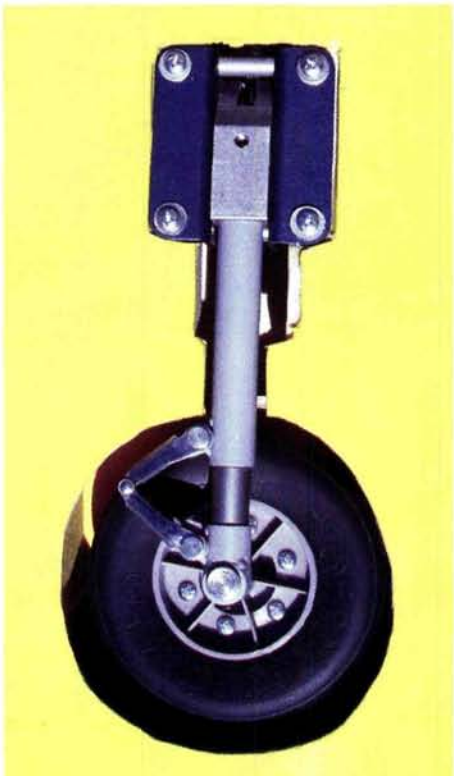
Top Flite's 1/5-scale, T-34B Mentor Gold Edition kit features all-wood, die-cut balsa and lite-ply construction. The wing features a sturdy I-beam wing-spar design that simplifies construction. Flaps also add to the model's scale appearance and greatly improve its overall performance; they're worth the extra effort it takes to build them. The wire landing gear is prebent, but I felt that a model of this stature needed retracts, so I chose to use Robart's (item no. 630BNZ); they're specifically designed for the T-34B, and I highly recommend them.

The kit is built using the same construction methods as Top Flite's civilian Beechcraft Bonanza; the tandem seats in the fuselage, the rudder and the larger fin are, however, departures. The canopy comes in two parts so that it can be made to slide open, and Top Flite offers an optional cockpit kit for a final scale touch. One useful item included in the instruction manual is a tear-out sheet that shows the plan in a reduced size. The kit includes a full complement of hardware, and the instruction manual (it's more like a small book) is highly detailed with many in-process construction photos. There are also little tricks of the trade. They call them "Hot Tips," and believe me, they do help. Overall, this is a very well-outfitted kit.

CONSTRUCTION

During construction, I used thick, medium and thin Great Planes Pro CA and 5- and 30-minute epoxy where necessary. Another must-have is Great Planes' Plan Protector; it really helps prevent subassemblies from sticking to the plans when you assemble them.

Before starting construction, I read the manual and identified all of the die-cut patterns to familiarize myself with them. Do not remove any of the wing ribs until you're instructed to do so; this helps to keep them organized. As with most kits, you should have at hand all the accessories necessary to complete the project; this saves a lot of time (and frustration), especially during those late-night



The Robart retracts designed especially for this plane fit quite well into the wings. The instruction manual explains how to install them.

specifications

MODEL: T-34B Mentor Gold Edition

TYPE: 1/5-scale sport military trainer

MANUFACTURER: Top Flite

DISTRIBUTOR: Great Planes Model Distributors

WINGSPAN: 80 in.

LENGTH: 63 in.

WING AREA: 1,025 sq. in.

WEIGHT: 14 lb.

WING LOADING: 31.47 oz./sq. ft.

RADIO REQ'D: 4-channel w/5 servos (6-channel w/9 servos for optional flaps and retracts)

RADIO USED: 6-channel Futaba T6XAS, R127DF receiver w/9 S3004 servos (elevator, rudder, throttle, steering, retracts, flaps [2], ailerons [2])

ENGINE REQ'D: .60 to .90 2-stroke or .90 to 1.20 4-stroke

ENGINE USED: O.S. .61FX 2-stroke

PROP USED: 12x6 Top Flite Power Point

FUEL USED: Wildcat 2 & 4 Cycle

PRICE: $200

FEATURES: CAD-designed, all-balsa and plywood kit; 3-piece ABS cowl and tail cone; 2-piece, clear plastic canopy that can be converted to slide open; I-beam wing-spar construction.

COMMENTS: anyone who is familiar with Top Flite kits knows the quality and workmanship that go into them. The T-34B's assembly is well thought out and designed with intermediate builders in mind. A careful reading of the instructions will yield a military trainer that you can be proud to display at the flying field.

HITS

- Professional-looking, well-designed instruction manual.
- A quick build with a fairly low parts count.
- Provides an excellent transition from a .60-size plane to a 1/5-scale aircraft.

MISSES

- None.

flight performance

TAKEOFF AND LANDING

I wanted to see how the T-34B would handle with the Robart retracts on our field. I was very pleased to see how well the plane tracks down a dirt runway. As I do on all flights, I gave my plane plenty of runway as a safety margin. Feeling confident that the O.S. 61FX would perform well, I advanced the throttle steadily until the T-34B reached sufficient speed; with a little backpressure on the elevator, it lifted off beautifully—rock-solid. When it reached a steady, safe climb, the pressure was off, and it needed only slight right aileron

trim to track straight and true. With the retracts up, the O.S. 61FX had more than enough power for the Mentor. This is a very pleasant plane to fly; intermediate pilots will be able to master it easily.

When I lined the T-34B up with the runway for landing, I chopped the throttle to just above idle. The descent was gentle and slow with flaps down, and it landed on the mains easily; tip-stalling wasn't a concern.

LOW-SPEED PERFORMANCE

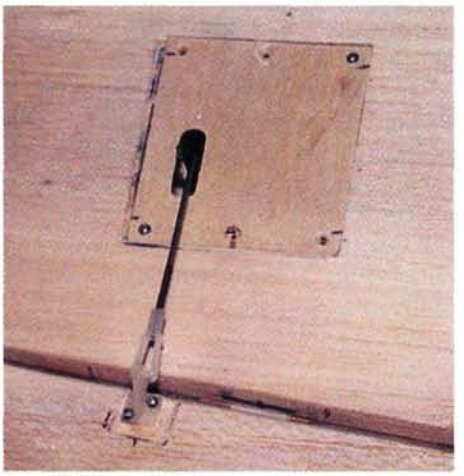
With the flaps deployed and the engine at about ¼ throttle, the Mentor flies quite slowly. I anticipated that a wingtip would drop in this configuration, but the wing didn't budge from its straight-and-level attitude. Power-off stalls were also straight ahead; I kept pulling the elevator stick back, and the plane just mushed along until the stall break. With high rates on both elevator and ailerons at slow speed, the T-34B Mentor doesn't show any bad characteristics; its controls are strong.

HIGH-SPEED PERFORMANCE

On the deck, straight-and-level high-speed passes are just too cool for words. Except for takeoffs, you can fly most of the time with the throttle set at around ¾. Even though the O.S. 61FX is in the lower end of the recommended displacement range, it has plenty of power for climbs, dives and other maneuvers, and I didn't see any sign of a high-speed stall.

AEROBATICS

When I fly a warbird, I like to confine aerobatics to scale-like maneuvers. Left and right rolls are fairly axial and seem to have the same roll rate; there is plenty of rudder authority for stall turns and hammerheads. High-speed dives and passes are definitely its forte—all topped off with a climbing 90-270 procedural turn at the end of the pass. I'm sure the Mentor is able to do more aggressive maneuvers, but it would be out of character for a model this magnificent. It's a fine machine—just like its big brother.



The thin plywood aileron cover is removable to provide easy access to the aileron servo.

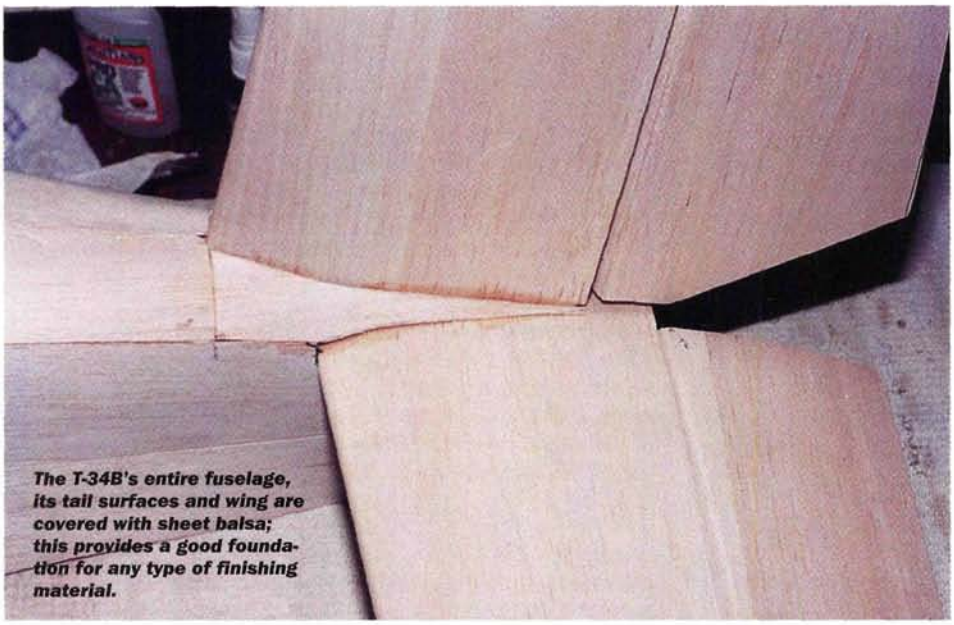
The T-34B's large fuselage provides plenty of space for the large fuel tank, standard size servos, Robart retract equipment and a full-scale cockpit. A custom Pitts-style muffler is available from Top Flite as well.

building marathons when the hobby shop is closed!

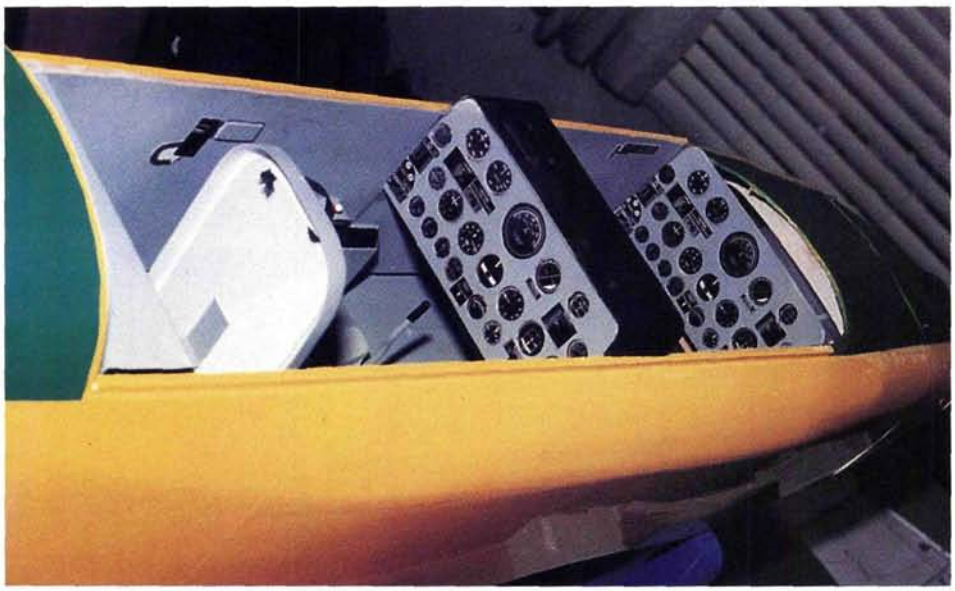
• **Tail surfaces.** Building them is the first step, and it's a straightforward, simple one. First, assemble the stabilizer, elevator, rudder and fin skins as instructed, and before the glue dries, make sure that the sheets are flat. The skins are oversize, and the kit includes templates to help you cut them accurately to the proper size. The tail surfaces are built over the plans, and the ribs for them all have jig tabs on their bottom edges; this results in a true, straight, flat surface. When you align the ribs, use a small square to make sure that they are all truly vertical. The computer-aided design ensures that the parts fit very precisely or tightly; they can almost be assembled before you add any glue. After you've built the basic frames, sheet them, and then cut the elevators and the rudder free. As you prepare to sheet the tail surfaces, be careful not to change the shape of the airfoil.

• **The wing.** The wing is built in three sections: the two outer panels and the center section. Make sure that your building surface is flat and that the rib's jig tabs are securely pinned to your work surface as you build. Before you begin construction, you must decide whether you're going to install retracts and flaps, as the rib subassemblies need to be built accordingly. Top Flite recommends that you build the right wing panel first so that your progress matches the photos in the manual. This is great advice.

Lay the ribs and spars over the plan, but do not glue anything until the instructions tell you to do so. The spars and ribs interlock, and they fit well. Make sure that the spar web fully contacts the bottom spar. Top Flite includes a die-cut, 90-degree gauge to help you keep the ribs vertical as you glue them. After you've glued the ribs and spars together, add the top spars and the leading edge to the panel. Sheet the top of the panel on the building



The T-34B's entire fuselage, its tail surfaces and wing are covered with sheet balsa; this provides a good foundation for any type of finishing material.



The scale cockpit kit really adds to this aircraft's detail; it's an option that's well worth the cost and the time needed to install it. If you include two full-body pilot figures, it's a good idea to use an engine from the higher range of power recommendations to compensate for the figures' weight.

board with the rib tabs flat on the table; be careful not to twist the wing. Remove the panel from the building table, and add the flap and aileron sub-ribs. Now build the left panel in the same way.

At this point, I installed the Robart retracts. Their installation went without a hitch, but it's very important that the gear rails be perfectly flat. Now add the hinge blocks, servo rails and hatches, and bevel the trailing-edge sheeting. Then set the panels aside, and build the center section. It, too, has subassemblies that must be built before it's framed up. After you've built the center section, sheet the top of it. Then prepare the dihedral braces, and fit them to the wing panels. Dry-fit the three wing panels together, and check their alignment. When it's perfect, separate the panels so that you can sheet their bottoms. Use a balsa cradle to align the wing panels while you sheet them.

After you've sheeted the panels, open the wheel wells, add the wingtip blocks, and then carve and shape them. Then complete the flaps and ailerons along with their linkages, and join the panels and center section to complete the wing. It sounds like a lot of work, but there aren't any tricks or hidden problems; just follow the instructions.

• **Fuselage.** Building the fuselage involves two steps: build the bottom half right over the plans, and build the top after you've sheeted the bottom.

The crutch system is very important because it sets the alignment of the entire fuselage. Remember, the fuselage has specific left and right side parts that must be assembled correctly to ensure that you have the correct engine thrust. Take a little extra time to perfect the stab saddles; your efforts will pay off later. After you've built the bottom but before you frame and sheet the fuselage top, work out your servo installation.

Add the remaining stringers; then fit the stab and fin, and glue them into place. Work carefully and accurately here; you don't want a crooked airplane, do you? Add the turtle deck, sheet it and fair it into the tail feathers. Hook up the rudder and elevator linkages; they will be covered by the removable tail cone. Add the rest of the sheeting, and mount your engine. I chose an O.S. .61FX with a Top Flite in-cowl muffler and header. Build the nose-gear mount on the front of the firewall, and install the nose-gear retract.

• **Finishing the final assembly.** This includes hooking up the throttle and steering servos, mounting the wing on the fuselage and sheeting the front forward deck. Before you begin to sheet the forward deck, install the fuel tank and check all fuel connections because you won't want to fix a leaking tank later! I completed the fuselage and added the optional cockpit interior. It greatly adds to the model's appearance.

Unless you plan to make the canopy so that it can be slid open, it's best to screw it into place on the fuselage. I painted the canopy with Testors gray enamel and then attached it with no. 2x3/8 screws. I painted the three-piece ABS cowl with yellow Top Flite LustreKote paint to match the yellow MonoKote that I used.

CONCLUSION

I've been building Top Flite kits since I started flying in the early '80s, and without exception, they are among the finest on the market. Their engineering and design are greatly admired in the industry, and you will agree when you assemble this one. When you've finished, your flying buddies will do all the admiring as you show off this excellent example of a military trainer at the field.

Futaba Corp. of America; *distributed by Great Planes Model Distributors; futaba-rc.com.*

Great Planes Model Distributors *(217) 398-6300; (800) 682-8948; greatplanes.com.*

O.S. Engines; *distributed by Great Planes Model Distributors; osengines.com.*

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Robart Mfg. *(630) 584-7616; robart.com.*

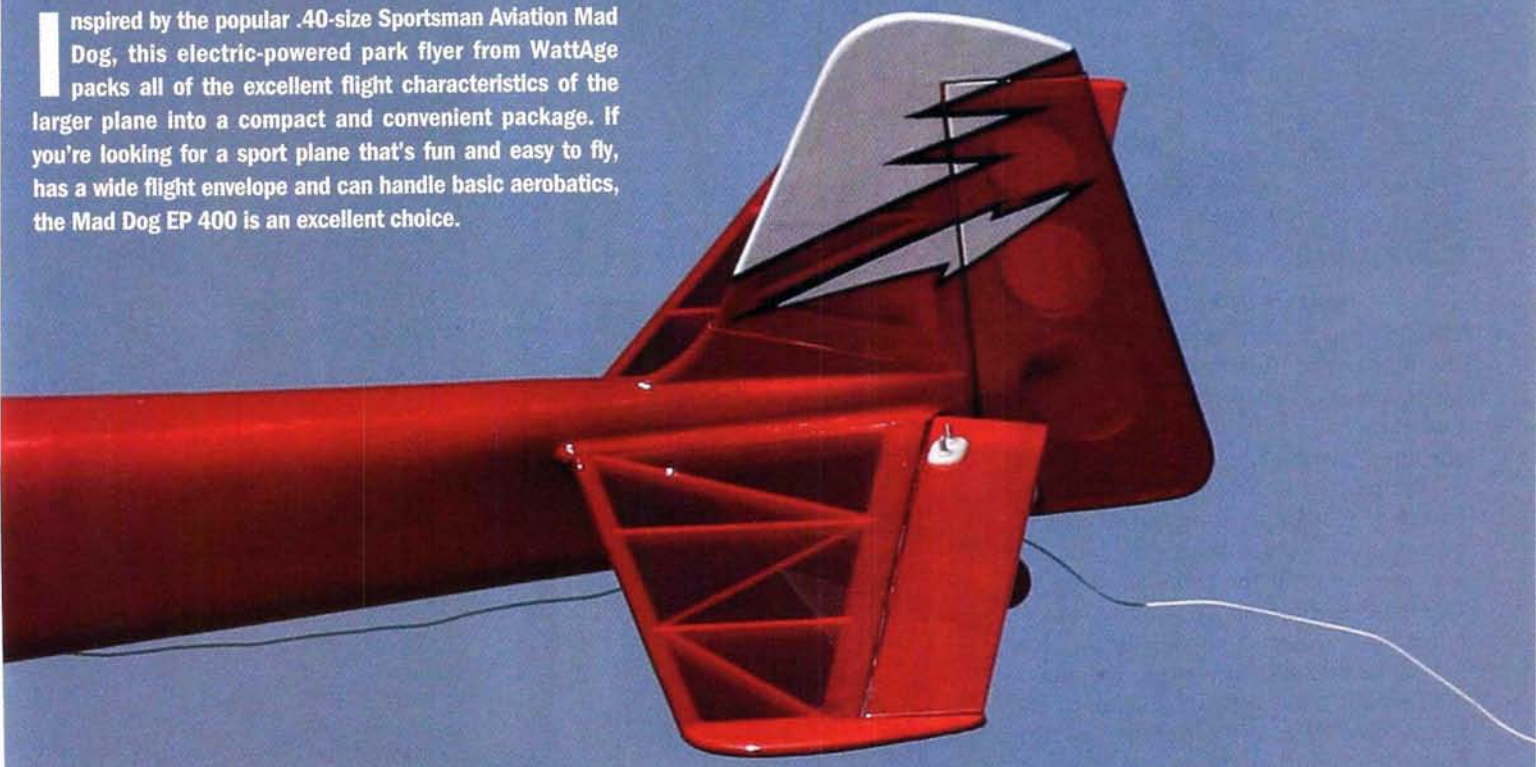
Top Flite; *distributed by Great Planes Model Distributors; top-flite.com.*

Wildcat Fuels *(859) 885-5619; orders only (888) 815-7575; wildcatfuel.com.*


Mad Dog

This electric ARF has performance to please!

Inspired by the popular .40-size Sportsman Aviation Mad Dog, this electric-powered park flyer from WattAge packs all of the excellent flight characteristics of the larger plane into a compact and convenient package. If you're looking for a sport plane that's fun and easy to fly, has a wide flight envelope and can handle basic aerobatics, the Mad Dog EP 400 is an excellent choice.



WATTAGE Mad Dog EP400

BY JOE WELSH

PHOTOS BY JOE WELSH & JOHN HEID

WHAT'S IN THE BOX

The first thing you'll see when you open the box is the illustrated and detailed instruction manual. Under that, you will find each half of the built-up balsa wing and the built-up stabilizers; all have been nicely finished in a semi-transparent red covering. A highly visible zigzag pattern on top of the wing will help the pilot see the orientation of the plane at all times. The lightweight, built-up wing has vacuum-formed wingtips glued to it—a nice touch. Underneath the wing, the vacuum-formed, painted fuselage is in a protective box. Next to the fuselage are two boxes that contain the included Super 400 cobalt motor and 7x4 propeller, canopy, wheels, wheel pants, landing gear, prop and nearly everything else needed to complete the plane. You'll only need a 4-channel radio, micro-receiver, three sub-microservos, a 30A speed controller, a 7-cell flight pack and adhesives to finish the plane.

ASSEMBLY

The Mad Dog can be assembled fairly quickly; the advertisement "Buy it today, fly it tomorrow" is not an exaggeration.

First, I epoxied the wing panels together with the included spar. I then glued the horizontal and vertical stabilizers to the fuselage. Before gluing anything to the plastic fuselage, be sure to sand the gluing surfaces so that the adhesive will have something to "bite" into. After allowing the epoxy to set up for a few minutes, I used the included CA hinges to hinge each control surface.

I made one small change to the order of the steps listed in the manual. I decided to install the landing gear later so that it

The Mad Dog's servo tray is precut; removing the wing permits easy access to the electronics.

specifications

MODEL: Mad Dog EP 400

MANUFACTURER: WattAge

DISTRIBUTOR: Global Hobby Distributors

TYPE: sport electric

WINGSPAN: 46 in.

WING AREA: 290 sq. in.

LENGTH: 33.5 in.

WEIGHT, AS TESTED: 27.2 oz.

WING LOADING: 13.5 oz./sq. ft.

RADIO REQUIRED: 4-channel with 3 microservos

RADIO USED: Futaba 9C with 2 Hitec HS55 servos and 1 Cirrus CS 09 servo and a Hitec Electron 6 receiver

DRIVE SYSTEM INCLUDED: WattAge Super 400 cobalt motor

BATTERY REQUIRED: 7-cell, 1300mAh Ni-Cd

BATTERY USED: WattAge 7-cell, CP1300 SCR

FLIGHT DURATION: 6 to 7 min.

PRICE: $119.99

FEATURES: vacuum-formed fuselage with ply support structures already installed; built-up wing and tail covered with semi-transparent red covering; vacuum-formed wingtips; comes with a cobalt motor, prop, canopy, wheels, wheel pants, landing gear, hardware and an illustrated construction manual.

COMMENTS: the Mad Dog is a stable performer that can go fast but can also slow down for landing. It's an excellent plane for an intermediate pilot who's looking for something with zip!

HITS

- Stable and fast.
- Easy to build.
- Looks great.

MISS

- Doesn't include a spinner.

flight performance

TAKEOFF AND LANDING

Takeoff was quite easy using a little right rudder. I "firewalled" the throttle, and the Mad Dog was airborne in about 30 feet with plenty of airspeed to spare. The climb angle is an impressive 35 degrees.

Landings are a pleasure with the Mad Dog. The plane is slippery enough for you to make a nice long approach and have a good flare before touchdown.

LOW-SPEED FLIGHT

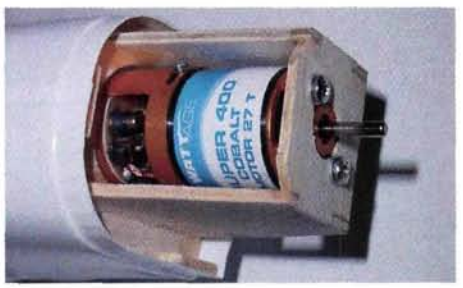
The Mad Dog slows down nicely, and landings are very comfortable for such a sporty plane. Because my model is slightly tail-heavy, it has a mild tendency to tip-stall at low speed if I use considerable up-elevator, but that was never a problem. In fact, you can use this tendency to get into a nice aerobatic spin!

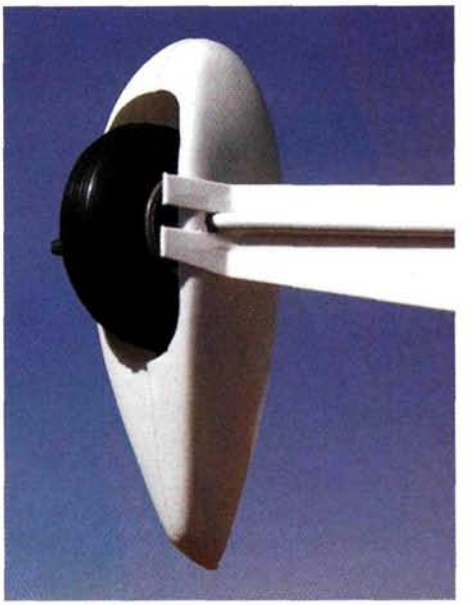
HIGH-SPEED FLIGHT

The included cobalt motor pushed the plane fast—even with only 7 cells.The Mad Dog's stability makes high-speed low passes over the runway a blast! Once you are familiar with the plane, you can go from a high-speed pass to a steep ascent and back to level flight again for some energy-management practice.

AEROBATICS

Loops are easy, but be sure that you attempt inverted flight from a good altitude because the dihedral of the wings makes the Mad Dog more comfortable right-side up. After you've mastered inverted flight on this plane, you will be a real pro!





Top left: ***the included WattAge Super 400 cobalt motor provided plenty of get-up-and-go.*** *Bottom left:* ***conventional control surfaces are easy to set up.*** *Center:* ***the single-servo aileron setup saves weight and minimizes cost.*** *Right:* ***all the hardware needed for the attractive landing gear is included in the kit.***

would not be in the way during the rest of the assembly.

All three servos are easy to mount in the servo tray, and the pushrods come built up with wooden dowels. I only had to center the servos and connect the pushrods to the control surfaces. The included motor was easy to mount in the motor mount, and the cowl is attached with three screws, so it's easy to access the motor. The Mad Dog doesn't come with a spinner, and although I couldn't find one in my workshop that was the right size, a slightly larger one fit reasonably well. The instructions suggest that you use the included spacers to keep the wheels centered on the axles. I found that the spacers were too thin to be used for this purpose, so I left them out and simply trimmed the wheel pants so that the tires would not touch them.

A Velcro battery strap is already installed, but I could not take advantage of it when I had properly balanced the plane. I moved the battery all the way forward (against the firewall), and the plane balanced without the need to add extra weight. The Mad Dog was now ready to take to the skies.

FINAL THOUGHTS

Assembly time is short, so the Mad Dog can be chewing holes in the sky in no time! The performance of WattAge's Mad Dog surprised me a bit: I expected it to fly well, but I didn't expect the wide performance envelope that the plane delivered while using only 7 cells! I was impressed by this plane's speed and ability to slow down. The included cobalt motor gives the Mad Dog the punch it needs to get moving, and the generous wing area allows you to slow it down to a manageable speed for landing. Two thumbs up!

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WattAge; *distributed by Global Hobby Distributors.*

SEAGULL MODELS

Space

Imagine flying in an open-cockpit airplane on a sunny afternoon. The wind blows around you as you enjoy the view below. If you don't have the full-size homebuilt to hop into, Horizon Hobby's Seagull Models Spacewalker II, with its nostalgic 1930s look, is almost as much fun to fly! The view from the ground of this sport-scale tandem-cockpit ARF is also hard to beat!

BY ERIC BEAN

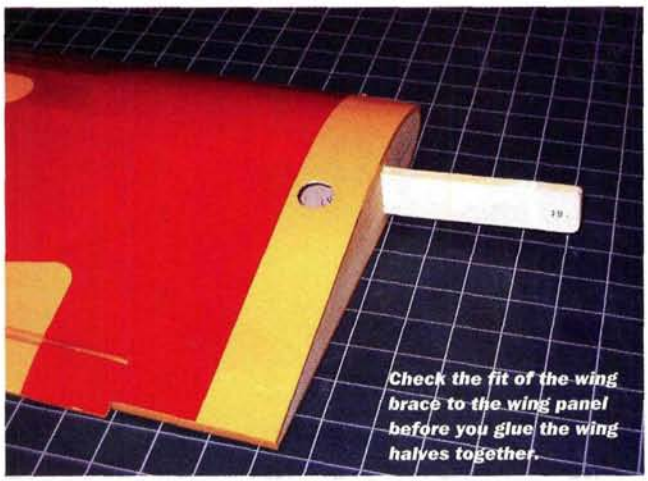
walker II

A sport-scale ARF of the famous homebuilt

This Spacewalker II kit offers more than most ARFs. All the pieces come individually wrapped to prevent them from being damaged and to organize the kit's contents. The blind nuts for attaching the landing gear come installed, the pushrods are assembled at the correct length, and all the control-surface hinges are already installed and pinned for security. The airframe uses built-up balsa and plywood construction that's assembled with epoxy and CA glues (I used Bob Smith Industries adhesives). The model is expertly covered and trimmed and comes with a painted fiberglass engine cowl and all the necessary hardware to assemble it. A painted pilot and a passenger figure are also included.

ASSEMBLY

Wing assembly is a cinch. When I dry-fitted the wing halves and plywood dihedral brace together, I found that they fit nicely and required no further adjustment. I used 30-minute epoxy to glue the wing parts together, and I used a little rubbing alcohol and a paper towel to clean up excess adhesive. Masking tape holds the wing parts together nicely until the epoxy has cured completely. I covered the wing joint with a strip of color-matched stick-on tape. Although there is no mention of the wing-bolt reinforcement plates in the text, several pictures show their proper placements over the predrilled holes. The installa-



Check the fit of the wing brace to the wing panel before you glue the wing halves together.

The tailwheel assembly is attached to a reinforced plate in the fuselage and secured to the rudder with a clasp. I used a small piece of fuel tubing to hold the receiver antenna to the tailwheel wire.

specifications

MODEL: Spacewalker II .40 ARF

MANUFACTURER: Seagull Models

DISTRIBUTOR: Horizon Hobby

WINGSPAN: 63 in.

WING AREA: 627 sq. in.

WEIGHT: 6 lb. 10 oz.

WING LOADING: 24.3 oz./sq. ft.

ENGINE REQ'D: .40 to .48 2-stroke; .50 to .72 4-stroke

ENGINE USED: Saito FA-56

RADIO REQ'D: 4-channel with 5 servos (rudder, throttle, elevator, ailerons)

RADIO USED: JR 8301 w/JR 517 servos

PROP USED: APC 13x6 Sport

FUEL USED: Morgan Cool Power

PRICE: $119.99

FEATURES: built-up fuselage and wing; UltraCote covering; all movable surfaces are hinged and pinned; fiberglass engine cowl, plastic wheel pants; installed landing-gear blind nuts; installed engine mount; installed throttle cable; hardware includes a fuel tank, assembled pushrods, control horns, clevises and spinner.

COMMENTS: the Spacewalker II is a great model to assemble and to fly. The parts fit nicely together, and the complete hardware package is very convenient.

HITS

- Easy to build.
- Complete hardware package.
- Great flyer.

MISSES

- Instruction manual has some omissions.

tion of the aileron servo, control horns and aileron linkages is easily completed following the instructions.

The tail feathers went on without any problems. I drew a centerline on the horizontal stabilizer, bolted the wing into place and then measured the distance from the wingtip to the corresponding stabilizer tip. The measurements were only 1/16 inch off, which is OK for this type of model. I then marked the outline of the fuselage on the stabilizer's top and bottom and cut away the covering, being careful not to penetrate the underlying balsa. The stabilizer saddle is plenty wide, so you don't need to cut away the covering right at the lines. Leaving about 1/16 inch of the material all around produces a very clean appearance after you've glued the stabi-lizer into place with 30-minute epoxy. Be sure to recheck the wingtip and stabilizer tip measurements, and clean up the excess epoxy.

Before you can fit the vertical fin and rudder into the rear of the fuselage, you'll have to open up the precut hinge slot. Be sure to remove the covering from the vertical fin before you glue it into its slot, and apply a dab of epoxy to the bottom rudder hinge before you slide it into its slot.

I didn't have any problems installing the elevator and rudder, but I had to bend the wire end to attach the elevator clevis to the control horn. The tailwheel bracket is attached to the fuselage with two screws, and a clasp and a machine screw hold the tiller wire to the rudder. The main landing can be bolted right on after you've attached the wheels and wheel pants. I did trim the wheel-pant openings a little so the wheels would fit properly.

The supplied fuel tank has a concave back, so be sure to cut your pick-up line to the proper length, or it won't be able to move freely in all directions. It took me several tries to get the length just right. I also added a small piece of balsa filler to serve as a platform where the tank rests against a fuselage stringer. I secured the tank with two pieces of 1/4-inch-square balsa—one across the back and the other across the bottom.

This Spacewalker II ARF goes together fast and flies great!

I chose to power the Spacewalker II with a Saito FA-56 engine. I think the sound of a 4-stroke suits this model well. The instructions call for a thrust-washer-to-firewall measurement of 5 5/8 inches. I replaced the stock engine mount with one that was adjustable to get the proper engine placement.

Since I installed the engine inverted, I added an onboard glow-driver system from C-Tronics. This unit is small, comes with its own battery and requires no adjustments. Set the throttle at idle, turn on the radio, advance the throttle to full and then back to idle, and the driver is activated. The driver turns itself off when the engine is advanced to 1/4 throttle. When you move the idle trim to cutoff, the driver shuts itself off and will remain off until you advance the throttle to full again.

There's lots of room inside the fuselage for the radio and to move the battery pack

walkin' with the spacewalker

As I was reaching down to the sides of the little cockpit for the seat belts, I found myself asking what seemed to be a logical question: if you built a model airplane that is on a 1:1 scale, where do you draw the line between model and full-size airplanes? Certainly, the Spacewalker begs that question, considering it's as close as you'll ever get to a man-carrying model airplane.

When Jesse Anglin of Hendersonville, NC, first laid down the lines for the Spacewalker homebuilt in the early '80s, he said he was trying to capture the essence of a 1930s sport airplane. I'm quite certain the same thoughts long ago went through the mind of a designer at VECO, one of the leading manufacturers of control-line model airplanes in the 1950s; as I cranked the little Lycoming into life and looked around, I felt for all the world as if I were sitting in one of the VECO Braves or Chiefs that had died so valiantly at the end of two wires leading to a handle in my quivering young hand.

The Spacewalker is one of those rare planes in which many curves cross: modeling becomes reality and reality loses some of its definition.

As I taxied out to the runway, I was acutely aware of sticking out of the airplane from my "love handles" up—a position that make me feel as if everyone was looking at me. Oh, everyone was looking at me because I was taxiing in front of the crowd at Oshkosh and it was impossible for them not to closely watch such an attractive little airplane—never mind the guy sticking up out of the front seat.

As I brought the power up, the Lycoming got louder, the runway began to move under me, and long before I was ready to raise the tail, the airplane floated off the runway. It wasn't so much a takeoff as a levitation. Those long, long wings reached out, grabbed some lift and went flying.

Once off the ground, I couldn't help but grin. I mean, after all, how often do you get to fly this kind of airplane without a transmitter in your hand? As I banked into a gentle climbing turn and headed out over Lake Winnebago, I half expected to glance down and see a couple of servos and a receiver pack under my legs.

At altitude, I found myself scrunching down a little to get my head down and out of the turbulence breaking over the top of the windshield. Otherwise, I was having a blast. Now *this* is true sport aviation. We weren't trying to convince anyone we were headed for a destination and saving time. We weren't trying to write it off our tax return. All we were doing was having more fun than is usually legal. Part of the fun was me snuggling up next to an EAA camera place to get our pictures taken. What a blast!

When you look at the Spacewalker, it's no stretch of the imagination to say it would almost be as easy to build the real thing as a finely detailed scale model. So, why not? 1:1 on an airplane this small barely gets you into giant-scale.—*Budd Davisson*

flight performance

For the first flight, we selected one of the few breezy, cloudy days we get in Southern California; but the wind was blowing down the runway and the sun poked out from behind the clouds occasionally.

TAKEOFF AND LANDING

The first takeoff roll was aborted because I didn't get enough right rudder input as I rolled the throttle up, and the model veered hard to the left. The second attempt was better, and after a short roll, the tail came up and the Spacewalker II lifted gracefully off the runway. A few clicks of up-elevator and right aileron trim got it flying straight and level. This model really requires coordinated control inputs (rudder and aileron together) to turn properly. Without rudder input, the model demonstrated adverse yaw and sagged into the turns. Keeping a little power in during the final approach until the model is over the runway's threshold provides a comfortable sink rate, and the model responds very nicely to rudder inputs to keep the centerline under the belly.

LOW-SPEED FLIGHT

With a wing loading of 24.3 ounces per square foot, the Spacewalker II doesn't float at low power settings but neither does it exhibit any bad habits when you slow it down to ½ throttle. Just remember to use coordinated aileron and rudder during turns. Power-off stalls will result in a spin, so gain some altitude before you chop the power.

HIGH-SPEED FLIGHT

This is not a high-speed airplane. Even at full throttle, the flight speed is very comfortable and scale-like. Power-on stalls result in an abrupt drop of the nose, but there is no tendency to spin.

AEROBATICS

The Spacewalker II performs all the basic aerobatic maneuvers with ease: loops, rolls, stall turns, Cuban–8s and inverted flight are all very straightforward. There's plenty of rudder authority for snaps and spins but not quite enough to hold altitude during knife-edge flight.

around to adjust the CG balance point. With the battery placed right behind the fuel tank, the model balanced perfectly without any ballast. I installed a Du-Bro Kwik-Switch Mount just above the wing saddle and routed the receiver antenna through the fuselage and out through a small hole drilled in front of the tailwheel mount. After I had glued the pilot and passenger into the cockpit, I screwed the windshields into place. I backed the screws out and added a drop of thin CA to "harden" the holes' edges.

FINAL THOUGHTS

This Spacewalker II ARF goes together fast and flies great. It's well built, and the complete hardware package is really convenient. It's hard to believe that you can get so much airplane for so few dollars. Pick one up, and while you fly it, imagine that's you in the open cockpit with your scarf blowing in the breeze!

APC Props; distributed by Landing Products (530) 661-0399; apcprop.com.
Bob Smith Industries (805) 466-1717; bsiadhesives.com.
Cool Power; distributed by Morgan Fuels (800) 633-7556; (334) 347-3525; morganfuel.com.
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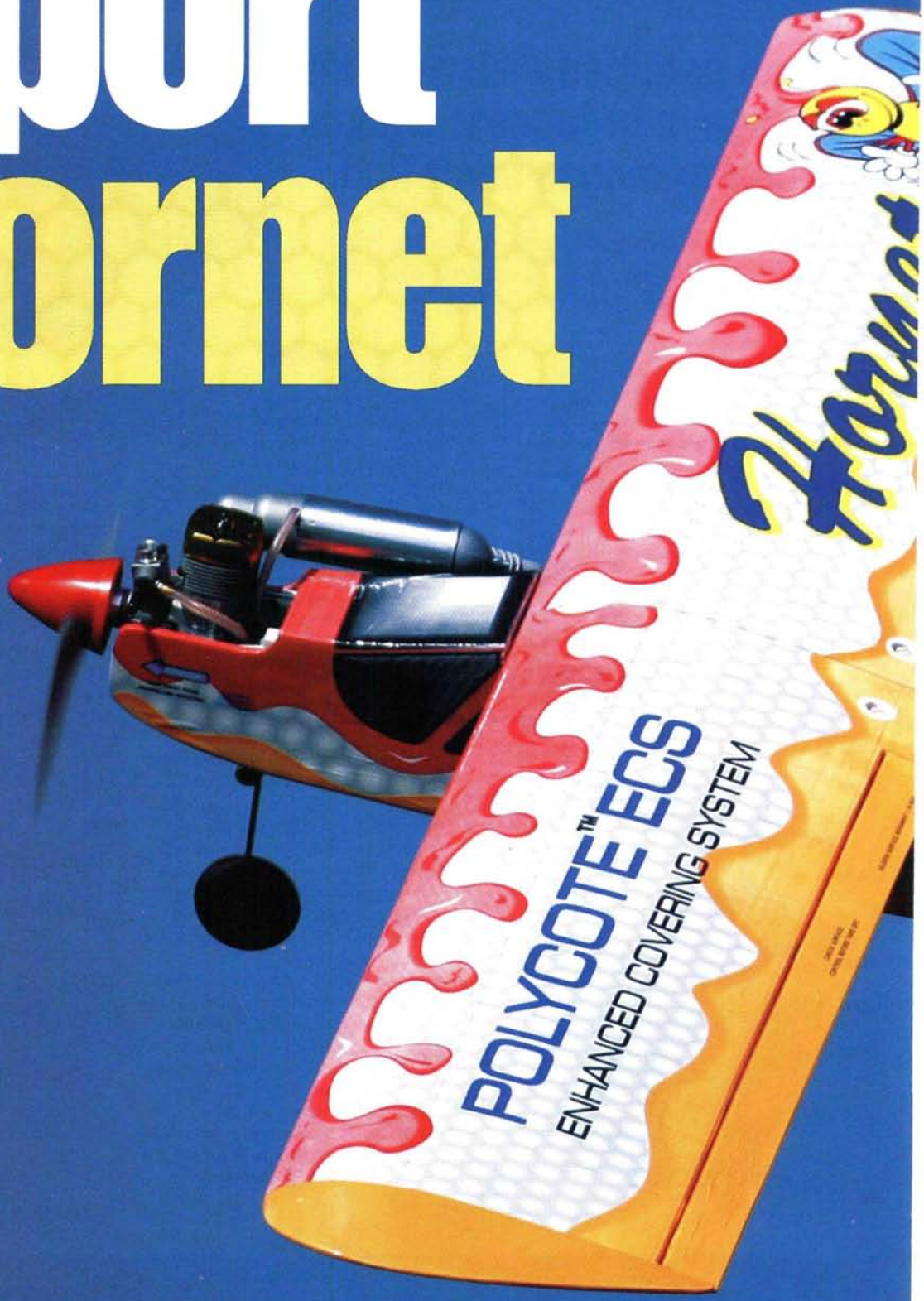
The pilot and passenger come painted and ready to fly!

VMAR Sport Hornet



BY JOE WELSH

Trainer

An easy-build, solid performer

So you've mastered your first trainer, but you aren't ready to step up to a low-wing aerobat. What's next for you?—the VMAR Sport Hornet Trainer. This semisymmetrical high-wing design with built-in dihedral and tricycle landing gear offers stable flight characteristics, yet it will help you to start doing basic aerobatics. It's available in blue and red and, between flights, bystanders will wonder how you created such an amazing paint scheme (I won't tell them that it arrives this way if you won't!). If you're wondering whether you can afford it, how does $89.99 sound? ... I thought so.

specifications

MODEL: Hornet Sport Trainer

MANUFACTURER: VMAR Mfg.

DISTRIBUTOR: Richmond RC Supply

TYPE: aerobatic trainer

WINGSPAN: 63.25 in.

WING AREA: 730 sq. in.

LENGTH: 48 in.

WEIGHT: 5.5 lb.

WING LOADING: 17.36 oz./sq. ft.

ENGINE REQ'D: .40 to .52 2-stroke

ENGINE USED: VMAX .46 Pro

RADIO REQ'D: 4-channel w/4 standard servos

RADIO USED: Futaba 9C w/4 Hitec HS-325HB servos and an FMA FS8 receiver (flight-stabilization system was disabled for this review)

PROPELLER USED: APC 11x6

FUEL USED: Wildcat 2 & 4 Cycle

PRICE: $89.95

FEATURES: built-up wing and fuselage covered with Polycote ECS covering; semisymmetrical wing; hinged control surfaces; installed engine mount; tricycle gear with steerable nosewheel; installed pushrods; spinner; wheels; fuel tank; extra parts; photo-illustrated assembly manual.

COMMENTS: the Sport Hornet's excellent manual minimizes building time, so it goes together quickly. In the air, it's a stable flyer, even at low speeds, so landings are stress-free.

HITS

- Great flight characteristics.
- Cool color scheme.
- Great instruction manual.

MISSES

- Some connectors are too small.

WHAT'S IN THE BOX

The well-written instruction manual features full-color photographs of many steps plus a cross-section view of the fuel tank. The two wing panels and the tail feathers are fully built up and covered with Polycote ECS plastic-film covering that has printed-on graphics! The fuselage is also built and covered, and the pushrods are installed and ready to be connected to the servos and control surfaces. The adjustable engine mount comes installed, and the parts package contains just about everything you need, including a spinner, wheels and extra parts in case you lose some. You assemble the Hornet in the usual way with basic tools.

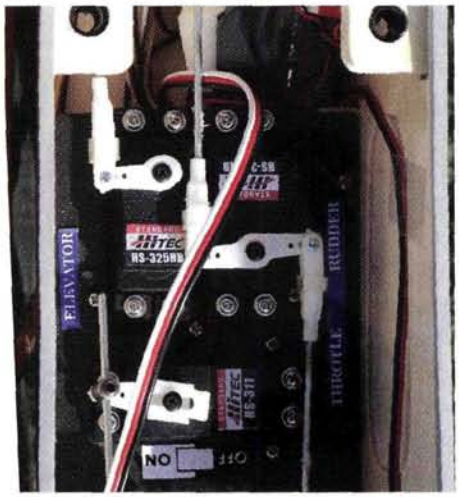
• **Wing.** All the control surfaces come hinged—a nice touch. On my Hornet, the torque rods had not been glued into the ailerons, and this allowed too much play in them. I removed the ailerons and cut four new hinge slots in each and in each wing half. A little 5-minute Z-poxy permanently attached the torque rods in holes on the ailerons' leading edges, and thin Zap secured the hinges. When the glue had dried, the ailerons worked perfectly.

Satisfied with the ailerons' fit, I joined the wing panels as specified in the instructions. When I trial-fit the wings, I found that I didn't even have to sand the spar; it fit properly right out of the box!

Next, I installed the aileron servos. A standard servo fit perfectly in the wing cutout provided; I drilled four holes for the servo screws, put a drop or two of thin Zap next to each hole to strengthen the wood and then waited for the glue to dry before screwing down the servo. I then connected the pushrods for the ailerons, and the wing was ready for flight.

INTO THE FUSELAGE

The elevator and rudder come hinged, so I first glued the horizontal stabilizer into the fuselage using 5-minute Z-poxy. I then epoxied the vertical stabilizer in place to complete the tail section. Note that the horizontal stabilizer is able to function upside-down or right-side up, but the airplane's color scheme dictates that it be positioned gray-side up.



The interior of the Hornet has plenty of room for all your gear. You can adjust the installed servo tray to accommodate any standard servos.

An open engine compartment allows complete access to the needle valve and fuel line, so you can refuel or "defuel" through the carburetor's intake fuel line.

I installed Hitec HS-325HB servos in the supplied servo tray that can be adjusted to fit any standard servos. After I installed the servos, I connected the pushrods for the elevator and rudder. Some of the supplied connectors that I used to connect the pushrods to the control horns were too short, and I wasn't able to thread the nut on them. I used a Dremel tool with a fiberglass cutting wheel to file down the control horn a little so that the bolt threads would protrude through, and I was able to thread the nut on. It's always a good idea to put a dot of

flight performance

TAKEOFF AND LANDING

With the Hornet's tricycle landing gear, taxiing could not be easier: line the plane up on the runway centerline, and just add power. Whether I "firewall" the throttle or just ease it up, the takeoff roll is completely manageable with little or no right rudder necessary. After the plane gains airspeed, a little up-elevator starts a healthy climb to a nice altitude.

Landings are really fun; I do touch-and-go's just to land again. As soon as I know I have the runway made, I just chop the throttle, let the plane fly close to the ground and just hold its nose up as the airspeed bleeds off. The plane slowly touches down on the main gear with the nosewheel still off the ground; hold the nosewheel off the ground for a few more seconds, and you have a flared landing that looks just like the real thing.

LOW-SPEED PERFORMANCE

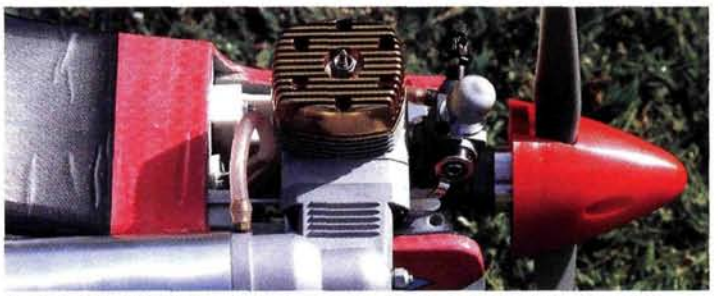
Any plane designed to be a trainer must have good low-speed performance, and this plane delivers. Its generous wing area lets the plane land at a leisurely pace. The dihedral in the wing helps to prevent tip-stalling and makes it quite easy to control, even at approach speeds.

HIGH-SPEED PERFORMANCE

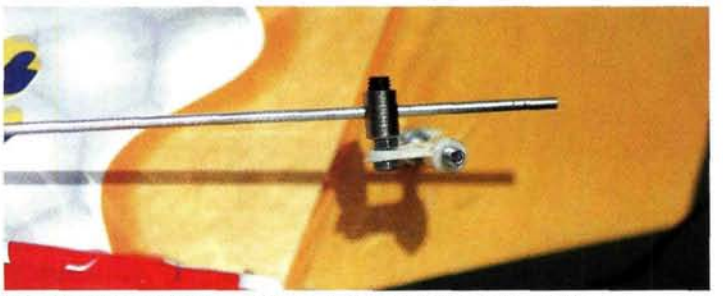
The Hornet is not designed to win any races, but it scoots along nicely at full power.

AEROBATICS

Planes similar to the Hornet like to fly straight and level; that's what makes them good trainers. In fact, if you roll it a little bit to one side, the Hornet will tend to roll right back to "wings level" when you release the controls. Basic maneuvers are a piece of cake. Since the Hornet has nearly vertical power, loops pretty much do themselves. Axial rolls and sustained inverted flight are just as easy.



The adjustable engine mount comes installed, so engine installation is straightforward and quite easy. Everything, including the fuel line, is out in the open, so routine engine maintenance isn't a problem.



The control horn throws are completely adjustable, and installing them takes only minutes without tools. Having an EZ connector at the control horn allows trim adjustments to be made at the control surface with just one tool.

thick CA on the threads after the nut is positioned to prevent it from working loose.

The engine mount is already installed on the firewall—nice touch! I just bolted a VMAX .46 Pro engine on, using the predrilled holes, and connected the throttle and nosewheel pushrods. The pushrod for the nosewheel interfered with the firewall, so I drilled the hole out slightly. After I installed the landing gear, I did a preliminary check of the CG and found that the battery should go as far forward in the fuselage as possible. I put it up against the firewall on the bottom of the fuselage and installed the fuel tank on top of it. The throttle and nosewheel pushrods run along opposite corners of the fuel tank, so to prevent the engine vibration from shaking the fuel, I packed foam rubber around the tank to insulate it.

I placed the receiver in foam rubber behind the servos. Although I could have mounted the switch harness on the servo tray, I chose to place it on the side of the fuselage for easier access. After I mounted the prop and supplied spinner, the plane balanced perfectly.

vmax .46 pro

This new 2-stroke features ABC construction with two ball bearings, and it's rated at 1.46hp at 16,000rpm, so it's suitable for a variety of airplanes. The VMAX .46 started immediately and, after proper break-in, performed flawlessly. With this engine in its nose, the Hornet could pull to nearly vertical ascents and easily perform basic aerobatics. The VMAX .46 Pro costs $67.95 by itself and just $49.95 when purchased with any VMAR airplane.

CONCLUSION

The Hornet took little time to assemble, and the finished product not only flies well but is also easy to see because of its eye-catching color scheme. It's also a great value at $89.95—especially considering all of the included items. With its stable flight characteristics, basic aerobatic capability and excellent low-speed performance, I can highly recommend the VMAR Hornet as a trainer or second aircraft to add to your hangar.

APC Props; *distributed by Landing Products (530) 661-0399; apcprop.com.*

FMA Direct *(800) 343-2934; (301) 668-4280; fmadirect.com.*

Futaba Corp. of America; *distributed by Great Planes Model Distributors (217) 398-6300; (800) 682-8948; futaba-rc.com.*

Hitec RCD Inc. *(858) 748-6948; hitecrcd.com.*

Richmond RC Supply *toll-free (877) 727-2329; (604) 940-1066; richmondrc.com.*

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TOP GUN

FIRST PLACE: EXPERT

First-place winner in Expert, Terry Nitsch brings his fabulous F-100F Super Sabre in for a landing.

FIRST PLACE: PRO/AM CLASS

Jeff Foley won the new Pro/Am class with his impressive Messerschmitt Bf-109E-4.

World-class scale at its best!

BY GERRY YARRISH

Held from April 28 through May 2, Top Gun 2004 was a grand showcase for some of the most impressive scale aircraft from around the world. Contestants from all over the country as well as from Argentina, Brazil, England, Hong Kong, Singapore, Thailand and Venezuela made this year's scale invitational truly an international event. Top Gun continues to be popular with pilots because it is always being tweaked and improved. This year, a new category—the Pro/Am class—was introduced specifically to increase contestant participation. Unlike the other three classes (Masters, Expert and Team), models flown in Pro/Am do not fall under the "Builder-of-the-Model" rule (pilots don't have to be the builders of the models they fly). Pro/Am rounds were flown on Thursday and Friday, and the top 15 pilots went on to compete in the final rounds on Sunday. As usual, four rounds were flown on Saturday and Sunday for Expert, Masters and Team. The best three out of four flight scores were tabulated and added to the model's static score to determine final scores.

When you boil it all down, the pilots and the airplanes make Top Gun the event that it is. The Lakeland Linder Regional Airport (home of the EAA full-scale Sun 'n Fun Fly-In) is a scale pilot's dream; whether you want a long strip of tarmac or a grass runway, Top Gun has it covered. As usual, the competition this year was very close, and the level of expertise shown by all the builders and pilots is the highest you see anywhere. From turbine jets and multi-engine bombers to WW I and II fighters and classic civilian aircraft, there's something to satisfy everyone.

All those associated with making Top Gun such a successful modeling venue, including the static and flight judges, the scorekeepers and the members of the Imperial RC Club, deserve a big "Well done!" For more information on Top Gun, check the FTE website at franktiano.com.

"Mr. Top Gun" winner Terry Nitsch taxis his F-100F back to the pits after another successful flight.

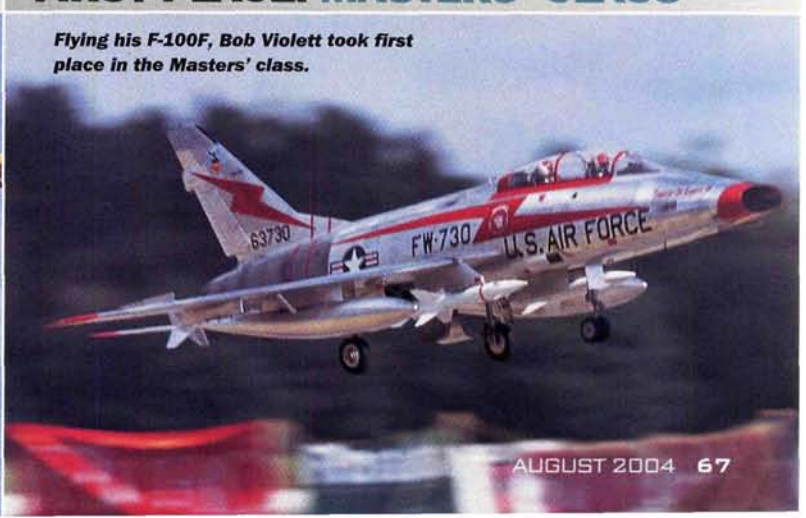
Pilots' meeting.

RST PLACE: TEAM

First place in Team Scale went to Graeme Mears and Dave Patrick, who flew Graeme's nearly perfect Piper PA-18 Super Cub.

FIRST PLACE: MASTERS' CLASS

Flying his F-100F, Bob Violett took first place in the Masters' class.



FIRST PLACE PRO/AM CLASS

The Pro/Am was created for pilots who fly aircraft that are no longer allowed to compete at Top Gun because of the 3-year rule and that they didn't build themselves. It gives guys a chance to compete without having their planes static-judged. You are awarded a flat 25 points if you supply any proof that the aircraft existed in the particular color scheme you've chosen! Next year, the class will actually be subdivided into Pro's and Amateurs—similar to Expert and Novice classes at other events. The Novice class will be open to those who have never flown at Top Gun and those who have flown but who finished in the lower 50 percent. As a result, more pilots will be able to compete, and more aircraft will be on display for the public to enjoy.

The winner of the Pro/Am class was Top Gun veteran and last year's "Mr. Top Gun," Jeff Foley, with his 86-inch-span, scratch-built Messerschmitt Bf-109E-4 powered by a Moki 2.10 glow engine.

Winner of the Critics' Choice and the Engineering Excellence awards, this unusual ¼-scale Brewster F2A Buffalo placed 10th in Team Scale. Piloted by Ray Johns, Mike Selby's aircraft has a 105-inch span and is powered by a 3W 150 twin-cylinder gas engine.

FIRST PLACE TEAM

Graeme Mears/Dave Patrick PA-18 Super Cub

No strangers to the winners' circle, builder Graeme Mears and pilot Dave Patrick captured the first-place slot in Team Scale with Graeme's nearly perfect Piper PA-18. Powered by a Moki 3.6ci twin-cylinder engine and controlled with Futaba radio gear, the ⅓-scale Super Cub has a 141-inch span and weighs 48 pounds. Graeme used ModelCAD to draw his own plans and to duplicate every nut, bolt, washer and pulley in his model, and that includes its metal fuselage-tube construction, scale control systems and rigging. Its landing gear alone is a masterpiece of scale replication.

Graeme's Super Cub earned a nearly perfect Static score of 99.667—the highest Static score overall.

FIRST PLACE EXPERT "MR. TOP GUN"

Terry Nitsch F-100F Super Sabre

Using a BVM F-100F Super Sabre, Terry Nitsch earned the title of "Mr. Top Gun"! Not only did he win first place in Expert, but Terry also took home the High Static award (Expert class) and the Runner-Up Critics' Choice award. His 70-inch "Stretched Hun" is powered by an AMT 450 turbine engine and is beautifully finished in the colors of Dean Cutshall's full-size F-100F Super Sabre. Dean thrills the crowd with his low-level, asphalt-scorching afterburner flybys at Terry's "Heart of Ohio Jet Scramble"!

Caught in an emergency go-around with one gear down and smoke trailing, this 1/10-scale B-17G was piloted by Mitch Epstein. Powered by four Zenoah G-23s, the 139-inch span Flying Fortress suffered a rough landing and placed 28th in Pro/Am.

This Fox 4.2-powered SBD Dauntless was originally built by Nick Ziroli Sr. and was resurrected by Bill Steffes. Extensively damaged at a previous Top Gun, the 100-inch dive-bomber looked as good as new and placed 24th in Pro/Am.

Fifth-place winner in the Masters' class and recipient of the Best Pre-WW II Air-craft award, Dave Johnson flew this great-looking 1/3-scale Albatros D.III. Powered by a Zenoah G-62, Dave's model has a 118-inch span and weighs 34 pounds.

TOP GUN WINNERS

EXPERT CLASS

Place	Modeler	Aircraft
1	Terry Nitsch	F-100F Super Sabre
2	Gustavo Campana	SU-37
3	Al Kretz	Spitfire Mk. 14
4	David Wigley	Hawker Tempest Mk. 5
5	Lee Rice	F4U Corsair
6	Sean Cassidy	F6F-5 Hellcat
7	Jack Diaz	Rafale
8	Tom Smith	Messerschmitt Bf-109G
9	Rene Alvarez	L-39 Albatros
10	Doc McCallie	P-39D Bell Airacobra

MASTERS' CLASS

Place	Modeler	Aircraft
1	Bob Violett	F-100F Super Sabre
2	Ramon Torres Sr.	Beech B-55 Baron
3	David Hayes	Rockwell Thrush
4	Dick Konkle	Aeronca 7AC
5	David Johnson	Albatros D.III
6	Richard Feroldi	Albatros D.V
7	Lloyd Roberts	Lockheed Vega
8	David Platt	Aichi Type 99 Val
9	Tom Polapink	Pfalz D.III
10	Hal Parenti	B-25 Mitchell

TEAM CLASS

Place	Pilot/Builder	Aircraft
1	Dave Patrick/Graeme Mears	Piper Super Cub
2	David Schulman/Joe Grice	F-100D Super Sabre
3	Dave Pinegar/George Maiorana	Tupolev Tu-4
4	Alex Lau/Hui Chi Leung	F-16 Falcon
5	Dean DiGiorgio/Tony Urbano	F4U Corsair

PRO/AM CLASS

Place	Modeler	Aircraft
1	Jeff Foley	Messerschmitt Bf-109E-4
2	Ramon Torres Jr.	Beech T-34C
3	Tom Dodgen	T-33
4	Dustin Buescher	F-86 Sabre Jet
5	Kent Nogy	F-100D Super Sabre

FIRST PLACE MASTERS' CLASS

Bob Violett, F-100F Super Sabre

When it comes to scale jets, everyone knows Bob Violett. Bob used his own Bob Violett Models twin-cockpit F-100F Super Sabre to win the Masters' class. Bob's model is built from a BVM kit, and it's powered by an AMT 450 turbine engine. Equipped with JR radio gear, the 1/7-scale Super Sabre has a 70-inch span, weighs 36 pounds and is finished with Pro Mark markings and Metal-Kote paint. With so many beautiful scale details, there's little wonder that Bob took the Masters' class top slot!

This beautiful AMT 450-powered BVM F-100D Super Sabre is the work of Joe Grice. He teamed up with David Schulman, who flew it to second place in Team Scale and earned the Best Jet Performance award.

Brian O'Meara flew Jim Hammond's KI-61 Tony to eighth place in Team. The 86-inch Japanese fighter is powered by an O.S. 1.60.

Third place in Team went to pilot Dave Pinegar and builder George Maiorana and their electric-powered Chinese AEW (Soviet Tu-4 with Chinese markings). The 1/15-scale, 4-engine Early Warning System aircraft has a 115-inch span and is powered by four MaxCim NEO 13Y brushless motors.

Ramon Torres Jr. gets some moral support from his caller (and dad) Ramon Sr. Ramon Jr. flew his 80-inch span, YS-1.40-powered Beech T-34C to a second-place finish in Pro/Am.

This 1/3-scale Aeronca 7AC placed fourth in the Masters' class. Powered by a Kavan twin 4-stroke glow engine, Dick Konkle's 141-inch-span aircraft also won the Best 4-Stroke Performance and Best Cockpit awards.

by the Model Airplane News *crew*

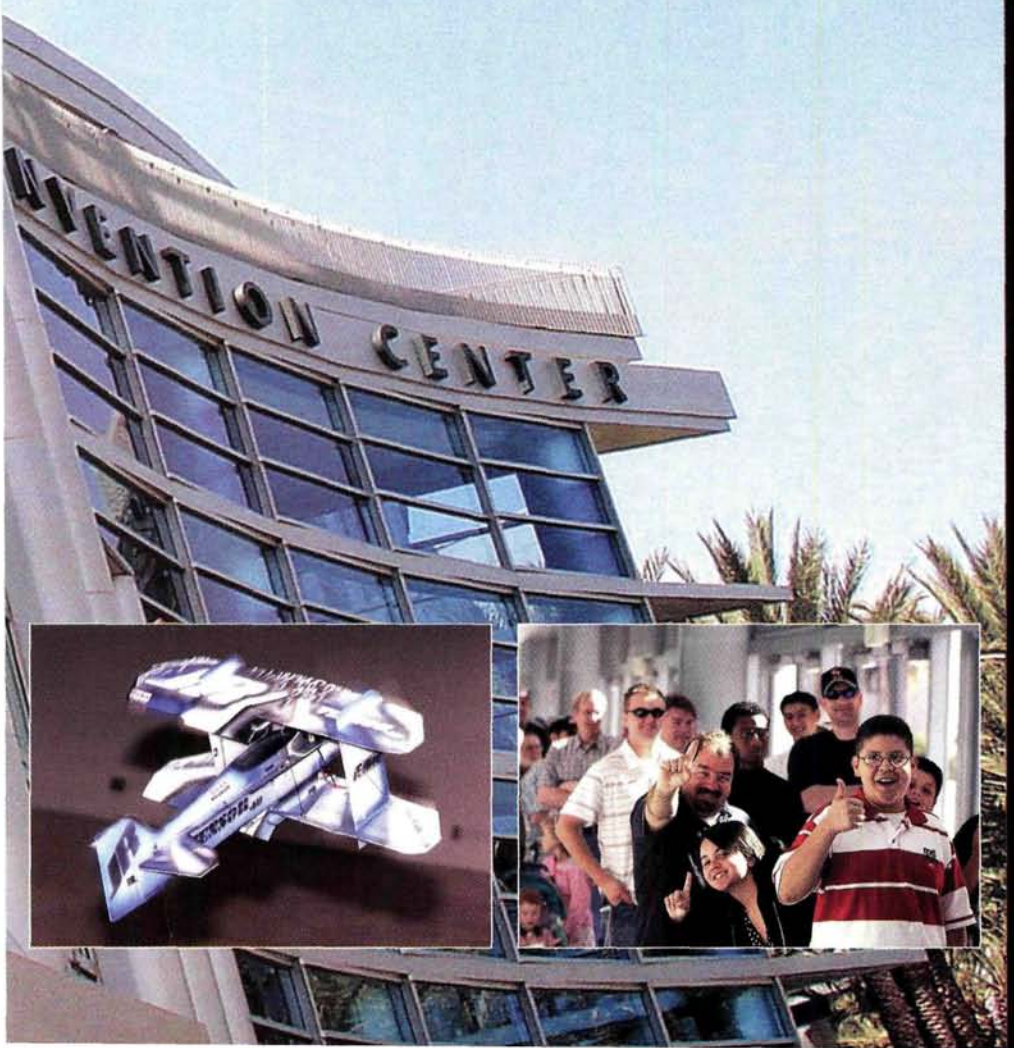
RCX 04

THE HOTTEST RC SHOW ON THE PLANET

Our second annual RCX show was held the last weekend in April at the Anaheim Convention Center, and it proved not only that the world of radio control has a huge following but also that a show where people can see the hottest vehicles *in action* is the way to feed their passion for RC. Last year's show was an amazing success, but the 2004 turnout blew away everyone's expectations. Thousands and thousands of avid RC'ers and curious newcomers were thrilled and amazed as RC craft of every type and description commanded land, sea and air.

This year, there were two fly zones that had multiple craft in the air all weekend long. Aerobatic displays by noted pilots like Hacker ace Jason Shulman and the Szabo brothers, a dizzying array of fantastic helicopter action from MS Composit, Global and Kyosho, as well as a parade of excellent park flyers from GWS riveted spectators all weekend.

For the ground-pounders, no less than three full-size RC car tracks (one dirt, one stunt and one on-road) featured demonstrations by pretty much any kind of wheeled RC vehicle you could think of. The Hobby People Try-Me-Track was a hit again this year; it gave spectators the chance to take the wheel of a high-performance electric touring car and race head to head with other fans. For the aquatically inclined, the boat pond was a huge success—a beautiful venue to witness everything from pocket-size electrics to mammoth gas-burning speed boats.

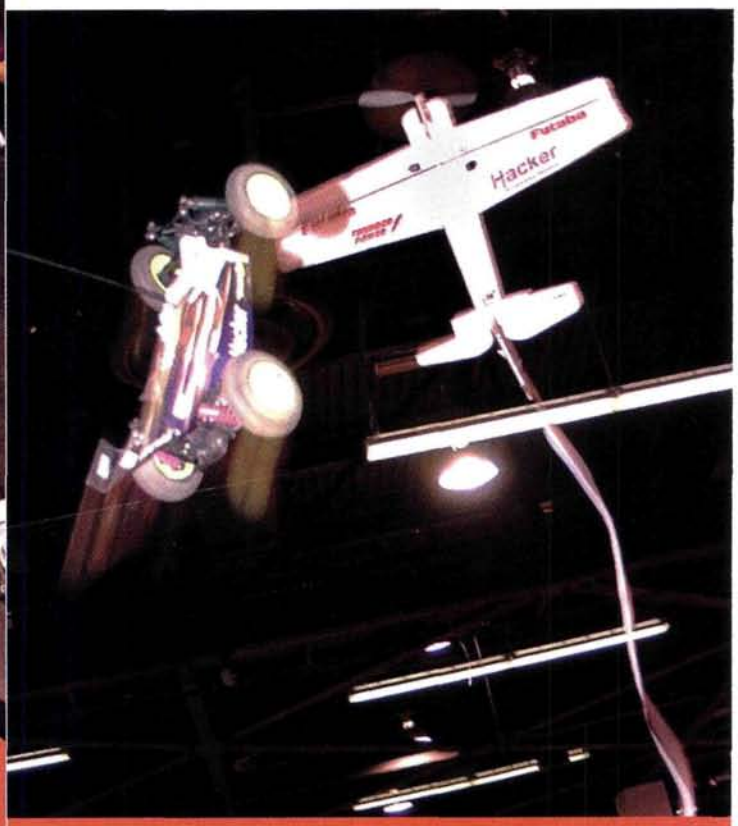


RCX 04

RCX is a collaboration between Air Age Media and Vision Entertainment, a mainstay in action sports and lifestyle events such as Hot Import Nights.

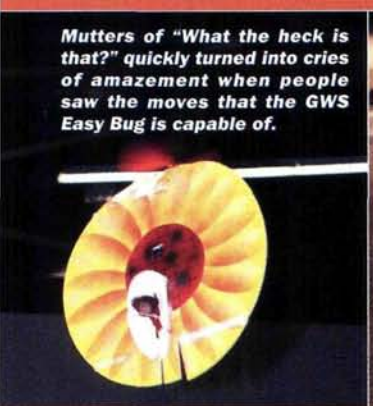
RCX continues to be a huge success that shows no signs of slowing down, so if you didn't make it there in 2004, you'll have a chance to catch the hottest event in all of RC'dom in Anaheim next May 20 to 22. RCX will also be coming to Chicago in summer 2005! There's nothing else out there like RCX, so don't miss it!

Above: from this bird's-eye view, you can see that the flight zones were packed with aircraft and spectators all weekend. **Below right:** Mike Greenshields was on hand to demo Global's little WattAge Micro Flyer.



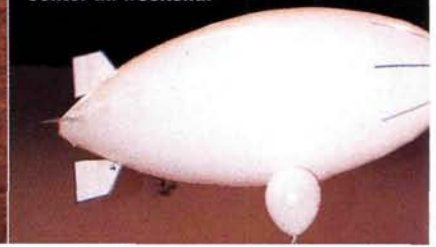
Above: Jason Shulman brought new meaning to "air traffic control" when he participated in an impromptu demonstration at the dirt track. Drivers hurled their RC cars off the big jump and over Jason's hovering airplane. **Below left:** as the crowd cheered, pilot and drivers got increasingly brave as buggy and plane moved increasingly closer to each other. **Below right:** something had to give, and it ended up being the foamie fuse plane. But it didn't go down without a fight—check out the buggy wheel that's in the hand of Jason's helper!

Mutters of "What the heck is that?" quickly turned into cries of amazement when people saw the moves that the GWS Easy Bug is capable of.



The RC car tracks were a big draw all weekend. The dirt track was the site of some seriously big air—for a ground vehicle, at least!

The West Coast Blimp circled high above the crowds in the Anaheim Convention Center all weekend.



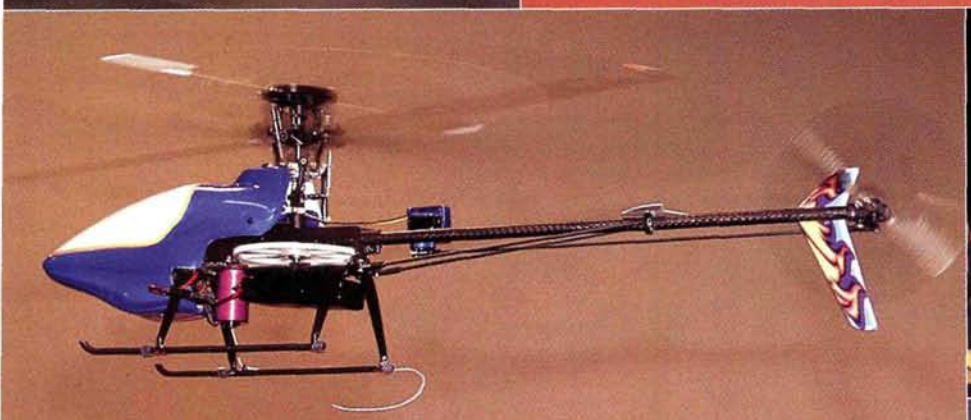
Above: GWS sponsored one of the flight zones, and its planes could be seen in the air almost any time during the weekend. Here, the Pico Cub shows off the easy, steady handling that has made it a favorite. **Below:** Midwest also demo'd some of its beautiful scale boats—like this Coast Guard MLB.

Above: West Coast Blimps provided sky-cam footage of all the excitement, including the door-to-door action at Kyosho's Mini-Z on-road track. **Below left:** meet Courtney and Becky; they helped us hand out magazines and get the word out about Model Airplane News and the other Air Age Media titles. If they offered you something, would you say no?

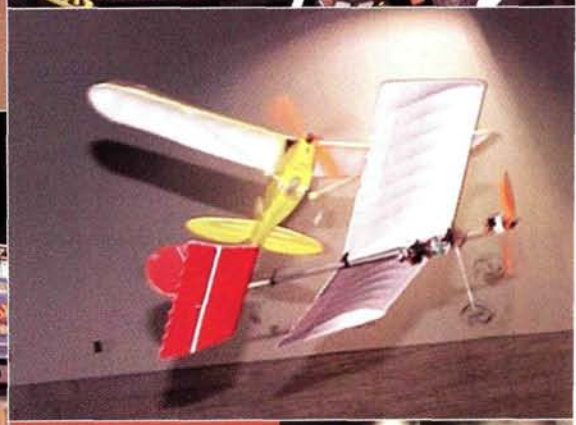
Left: Danny Szabo is one of the young guns who are stretching the electric aerobatic envelope right now. He and his brother Alan wowed the show crowds all weekend. **Below left:** for superior flight performance in a simple and inexpensive package, it's hard to beat GWS's Slow Stick. **Right:** profile electric aerobatic models are all the rage, and with the kind of inexpensive performance they offer, it's no wonder. Jason Shulman showed off what his Hacker-powered Guppy could do by popping glitter-filled balloons one after another at show center. **Below:** where else but RCX would you see a Hyundai painted like a creature from the movie "Alien"?

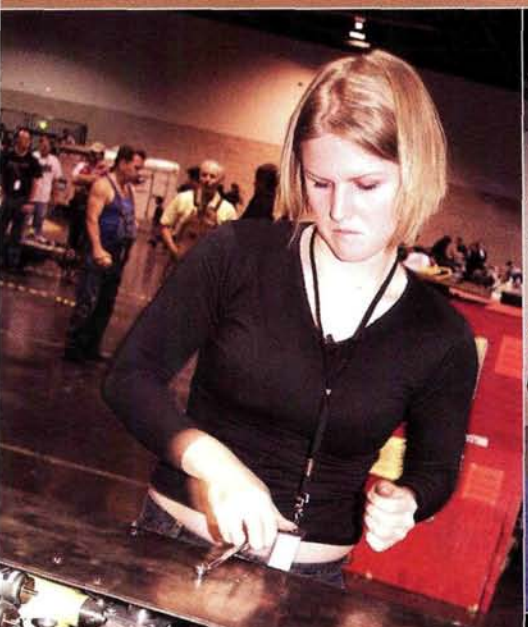
RCX 04

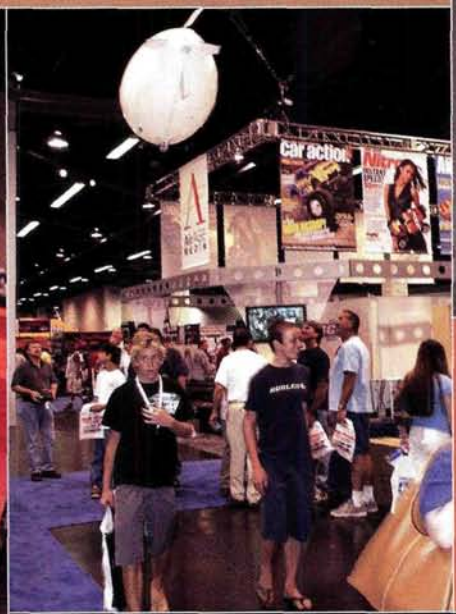
Above: the Try-Me-Track allowed people in the crowd to come up and try their hands at driving a 1/10-scale touring car. *Left:* one of the most impressive helis at RCX 04 was this twin-rotor CH-46 Sea Knight from MS Composit. It was amazingly smooth and quiet despite having twice as many moving parts as most helicopters. *Below:* the avid RC'ers from the band Static X lent star power—and their driving talents—to the car demos.



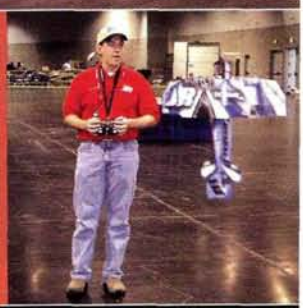
With an ultralight chassis and brushless power now standard on most helicopters, the RCX demonstrations showed just how much the state of the heli art has been elevated.

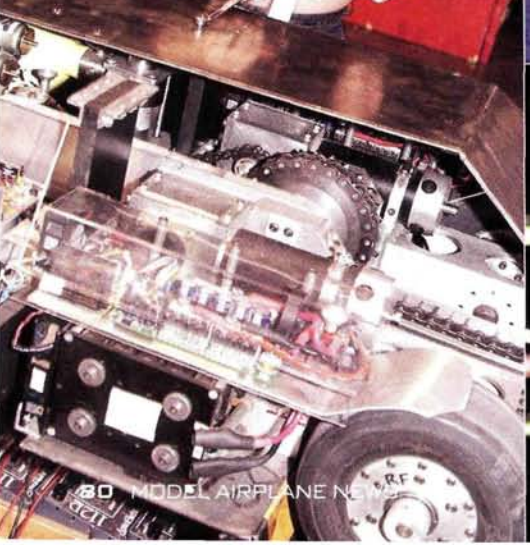






Above: the flying zones were expansive, but there were still a few close calls, like this one between the GWS Cub and Slow Stick. *Right:* the demos by 3D pro George Hicks were very smooth and polished. Rumor has it that Horizon Hobby will offer his Tensor 4D as a kit—stay tuned!

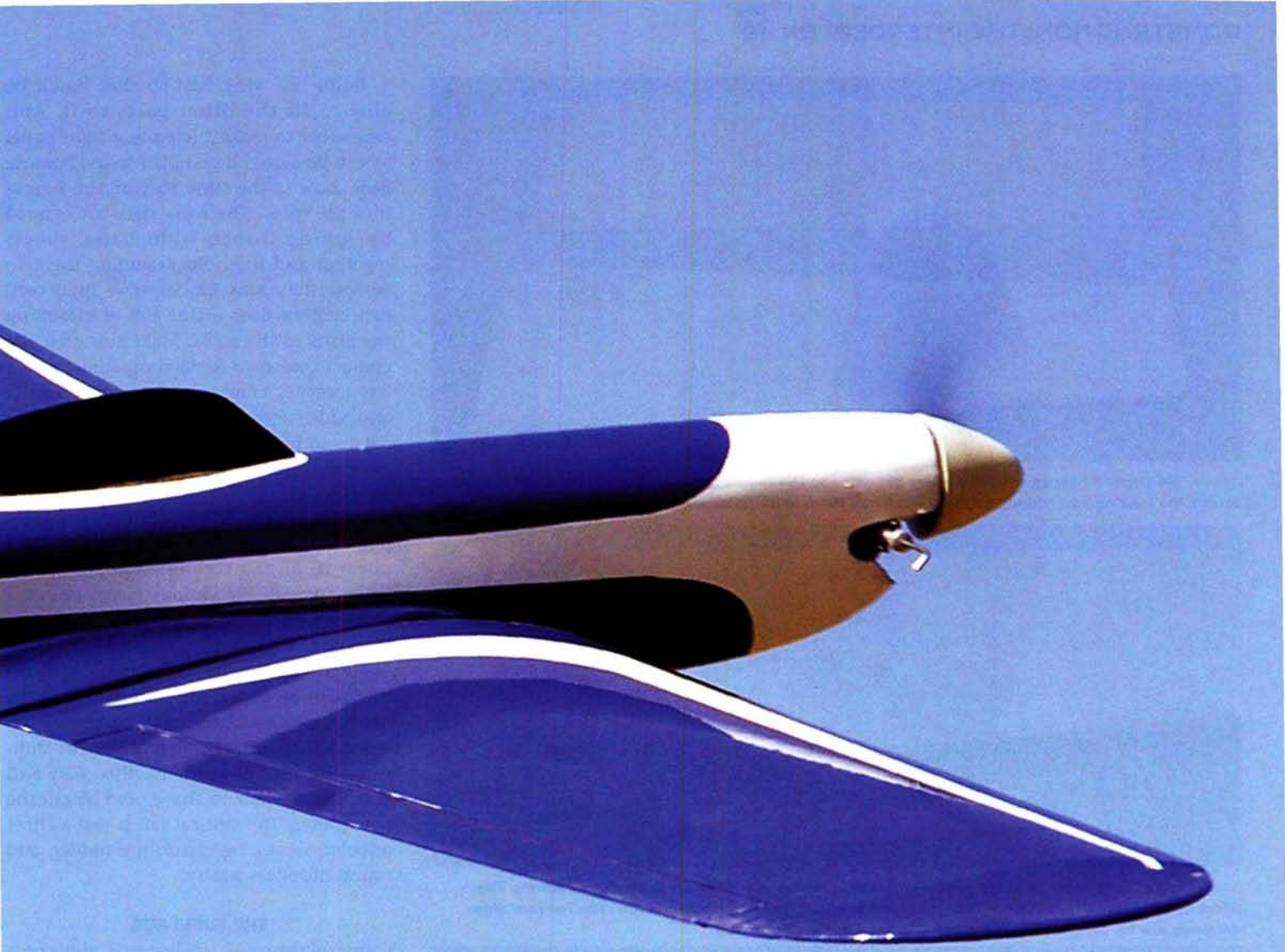




Left: battles among the metal-twisting Steel Conflict robots were crowd favorites! In between rounds, the robots require a little TLC in the pits. *Below:* the Global's new Shogun 400 is an impressive mini heli that has a lot of performance. ✚

The Interceptor Jr.

by Dave Robelen

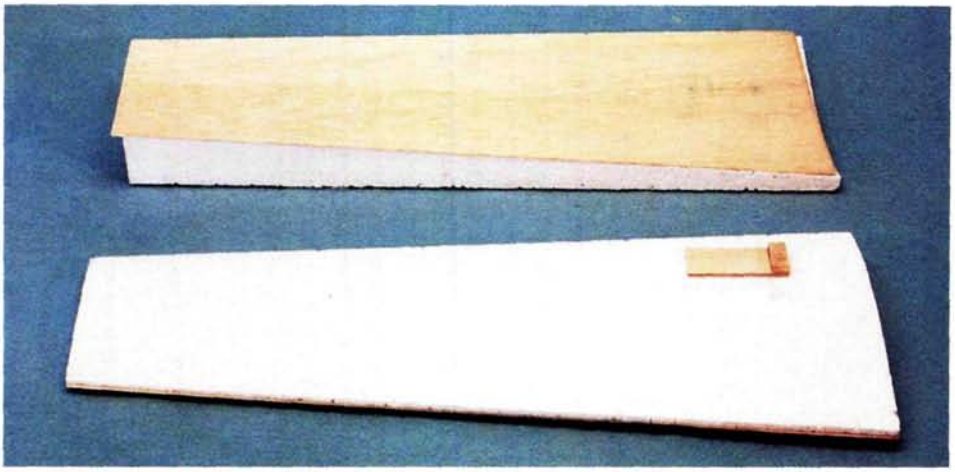


A sleek, ½A version of the classic Pappy deBolt design

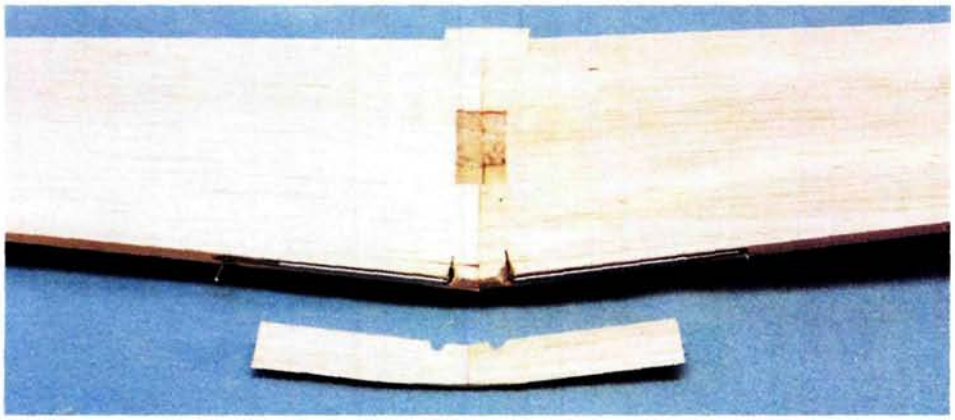
More than 40 years ago, in the January 1964 issue of *Model Airplane News*, Harold "Pappy" deBolt introduced a cutting-edge aerobatic pattern model that truly stood out from the pack. With features such as a fully cowled engine, retractable landing gear (his own design), NACA airfoils and an incredible attention to detail, the Interceptor was a revolutionary model. As much as I admired this elegant machine, my budget at the time forced me to pass it by, but I never forgot this dream machine.

With RC gear continuing to shrink, I decided to build a ½A replica of Pappy's design. In the interest of simplicity, I made a few changes. Instead of a full engine cowl, I made a "wraparound" cowl that's open on the bottom. To keep the model streamlined and to save weight, I omitted the landing gear. (Hardpoints to attach simple landing gear are shown on the plans.) Features such as the wing airfoil and the streamlined planform have been faithfully retained.

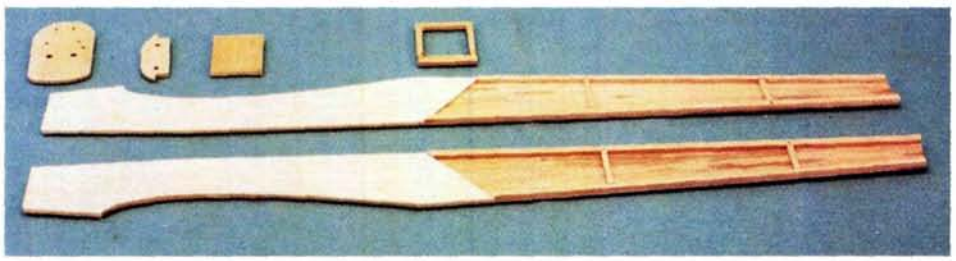
My favorite engine is the Norvel BigMig .061 RC, so I sized the model to be compatible with it. My onboard system is a mixture of a Berg 6-channel receiver, Cannon RC, Hitec and JR servos, a mini Futaba switch and an FMA Direct 110mAh battery pack. To control the model, I used a Hitec Prism 7X transmitter with a Spectra module. The fuel tank is an old plastic medicine bottle with a homemade stopper.



Above: **3M Super 77 spray adhesive holds the skins to the foam-core, and Elmer's Pro Bond is used to attach the leading and trailing edges. Tape holds them in place until the glue dries.**



Above: **the aileron servo is in the center of the wing and is placed in the cutout area shown. The ailerons use torque rods for control.** Below: **parts count for the fuselage is low. The forward side doublers are balsa; ⅛-inch-square balsa is used in the aft section.**



How does the BigMig engine run inverted? Glad you asked! Actually, I found no significant difference except in starting; I just flip the model over for this task. Make sure that the fuel-tank centerline is level with the needle valve.

I usually build wooden-framework wings, but the Interceptor Jr.'s airfoils benefit greatly from a smooth, non-wavy surface, so I chose to use foam-cores and to sheet the wings. Done carefully with light materials, there is no significant weight penalty, and the finished wing is a thing of beauty. Balsa sheet and blocks (carved and hollowed) produce a fine fuselage, while the built-up structure in the stabilizer helps keep the CG reasonable. Leaving off the landing gear was a definite help. The model's all-up weight is only 13.5 ounces.

CONSTRUCTION NOTES

Fortunately, building the Interceptor Jr. doesn't involve any really difficult areas. For the most part, the balsa I used was medium grade, except for the wing skins that were fairly light stock. The low-density, 2-inch-thick foam used for the wing-cores (the beaded variety) is insulation material; several model-supply outlets offer this foam. I cut my core templates out of 1/16-inch plywood, but any hard material can be used. Make sure that the edges are sanded and polished smooth to prevent the cutting wire from snagging on them. I use a very simple hot-wire bow and nichrome wire from Sig Mfg. I use an ancient variable transformer for my power supply. The wire should be just hot enough to slice smoothly through the foam without melting it excessively.

Build the wing first so that you'll be able to fit the other parts to it. And remember to make a left and a right panel as you go along! If you plan to use landing gear, now is the time to glue the blocks into the cores. The wing skins are formed by gluing 3-inch-wide balsa sheets together and then block-sanding them to smooth the seams. 3M Super 77 spray contact cement does a fine job of attaching the skins to the cores. Make sure that the contact cement is foam-compatible, as 3M has recently changed the glue's formula and added acetone. The plans show all the details to hinge the ailerons and make the aileron torque rods.

THE STABILIZER

Build this part on the plan with wax paper under it. All the core material is 3/16-inch balsa; slice all the various pieces out of a single sheet. Pin the edges into place, gluing parts together as you go. Glue the 1/16-inch caps on the top, lift the stab off the plan, and then glue the bottom caps into place. Sand the stab to the cross-section shown in the plan side view, thinning the caps toward the tips. Cut and sand the elevator to shape, and install the wire joiner. The vertical tail is just a sheet of balsa; sand a taper into the rudder, and round the edges neatly.

THE FUSELAGE

Construction will go faster if you cut a "kit" of parts to work with. This is a good time to drill the necessary holes in F1 and F2 to mate with your engine mount and fuel lines. I used 1/16-inch balsa doublers on the forward part of the balsa sides and 1/8-inch-square balsa strips in the rear. Glue the firewall and temporary bulkhead to one side; then glue the other side into place. Check for squareness, pull the tail ends together and glue them. Install bulkhead F2 and glue the crosspieces in the rear. Block-sand the top and bottom edges flat and smooth, and install the rear 1/16-inch bottom sheeting. Tack-glue the top blocks and the cowl block into place; then cut, shave, whittle and sand the fuselage to the proper shape.

Match the fuselage opening to the wing until there are no gaps; then glue in the attachment parts, alignment dowels and plywood wing-attachment plate (I used plastic 4-40 wing-attachment screws).

One of the Interceptor's main features was the fillets, so be sure to add them to your model. After the wing has been attached to the fuselage, cut the stab saddle to shape and fit the stab into place, but don't glue it yet!

specifications

MODEL: Interceptor Jr.

TYPE: ½A aerobat

WINGSPAN: 38 in.

WING AREA: 231 sq. in.

WEIGHT: 13.5 oz.

WING LOADING: 8.4 oz./sq. ft.

AIRFOILS: symmetrical, low-drag, 18% root rib, 12% tip rib

ENGINE USED: Norvel BigMig .061 RC

RADIO REQ'D: 4-channel (rudder, throttle, aileron, elevator)

COMMENTS: designed by Dave Robelen, the Interceptor Jr. is a ½A version of Harold "Pappy" deBolt's 1964 classic aerobatic pattern design. The model uses a lightweight, traditional, balsa fuselage and foam-wing construction. The design can be flown with or without landing gear.

Above: the fuselage starts to look like something after the balsa blocks have been carved and shaped. Left: the engine-cowl blocks are open at the bottom for easy access to the engine and throttle linkage.

COVERING AND FINAL ASSEMBLY

I used Super MonoKote and pretty much followed the instruction sheet. The fillets are covered with a separate strip, and the rounded tip of the sealing iron is really handy for getting the covering smooth. As the plans show, I made a canopy out of block balsa and covered it with MonoKote. When your little beauty is all covered, the tail and canopy may be glued into place and the control surfaces hinged together. (I cut strips out of Mylar drafting stock and glued them into place with thin CA.) If you plan to use landing gear, now is the time to attach it.

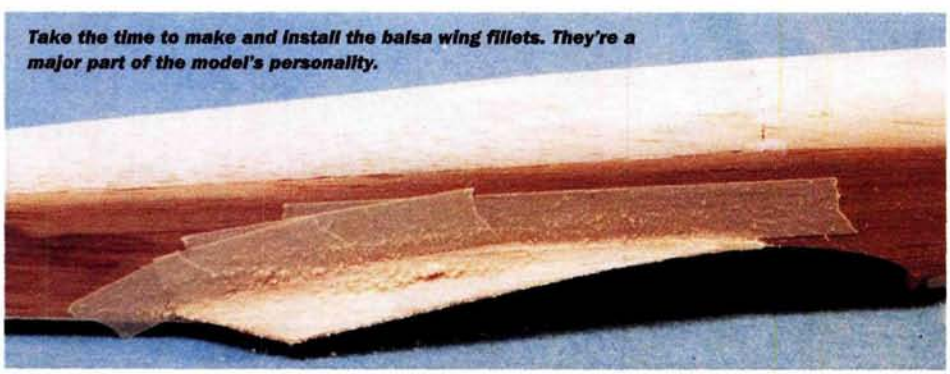
I used old Rocket City control horns, but thin plywood horns would work just as well. Pushrods can be made from stiff ⅛-inch-square balsa with 1/32-inch wire ends. At the servo end, I used a straightened wire paper clip (a perfect fit to the servo-arm holes). There is little room to move the gear around, so install the servos where they fit best. I used a Dave Brown engine mount and fastened things with small self-tapping screws. The lines inside my tank are made of small Du-Bro silicone tubing. The fuel fittings on the BigMig .061 are fairly large, so you may have to use larger silicone tubing. Attach the prop and spinner, and then slip the battery into place and check the CG. My prototype balanced just right with no ballast needed. Be sure to use the balance point shown on the plans. Go ahead and give the battery a full charge, and cycle the controls to check for binding. Clear up any problems, and set the control throws for ¼ inch up and down on the ailerons and elevator and all the rudder you can get without its jamming against the elevators.

AT THE FLYING FIELD

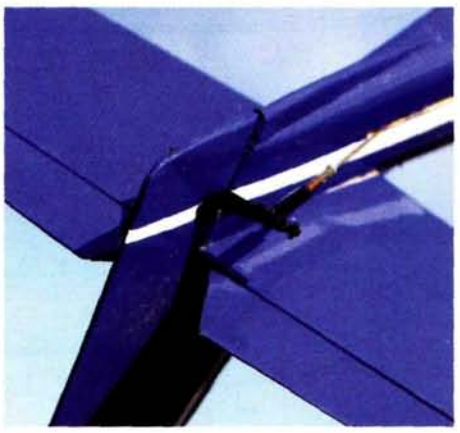
There is little to caution you about. This is one smooth bird with no bad habits. If possible, get someone else to launch it for the first flight so you can be ready to take control. As I hadn't run the engine in about six months, it took a while to dial it in. At last, the little mill was singing, and I had run out of excuses for not flying the model. There was nothing to do but toss the model and grab for the sticks. The wings stayed level from the start, but the model started to drop a little too fast. Back with the stick, and up it went. My first impression was, "Wow, it's fast!" My second thought was, "Oh boy, it's really smooth!" I spent most of the first flight getting a feel for the controls and checking the model's stall behavior.

Response was a little too quick on the ailerons, but the rest was quite reasonable. I backed off on the aileron throw and flew again but found that I actually preferred the quicker roll rates from the first setup. Exponential to the rescue! Now I can fly a smooth, slow roll and still get the rapid roll needed at the center of a Cuban-8.

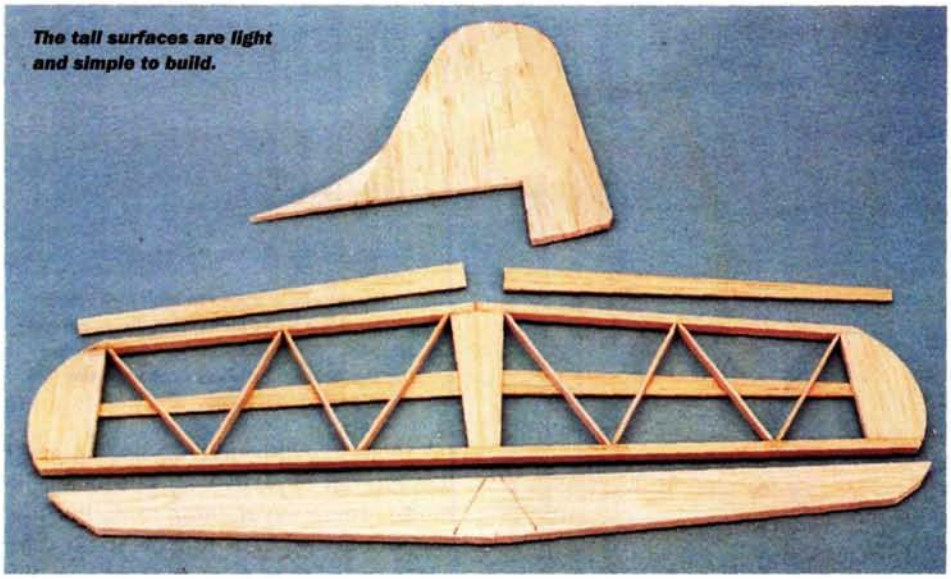
Overall, the Interceptor Jr. appears to possess most, if not all, of the desirable features of the original without introducing any unpleasant small-model quirks. Breezy weather isn't a problem, as this little bird has great penetration! It also has great vertical pull. The model smoothly executes a figure-M with ¼ rolls without rushing the top. If you execute a split-S into a downwind run, the speed buildup is downright startling for such a small engine. This is one bird that others will



Take the time to make and install the balsa wing fillets. They're a major part of the model's personality.



I used Rocket City control horns on the prototype model, but you can make them out of 1/16-inch ply, if you prefer.



The tail surfaces are light and simple to build.

I used a combination of various radio-gear components. Use your favorite mini radio gear.

The final aileron servo and linkage assembly.

stop to watch and then ask where they can get one.

Once you have a few flights, adjust the controls to your liking. Be sure to range-check your equipment with the engine running at various speeds. The Interceptor Jr. is a fast little bird, so allow ample room before you try new maneuvers. Enjoy!

Berg; *distributed by Park Flyer Motors (618) 558-5818; parkflyermotors.com.*

Cannon *RC (702) 896-7203.*

Du-Bro *(800) 848-9411; dubro.com.*

FMA Direct *(800) 343-2934; (301) 668-4280; fmadirect.com.*

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Great Planes Model Distributors *(217) 398-6300; (800) 682-8948; greatplanes.com.*

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JR; *distributed by Horizon Hobby Inc. (800) 338-4639; horizonhobby.com.*

Norvel *(800) 665-9575; (805) 547-8360; norvel.com.*

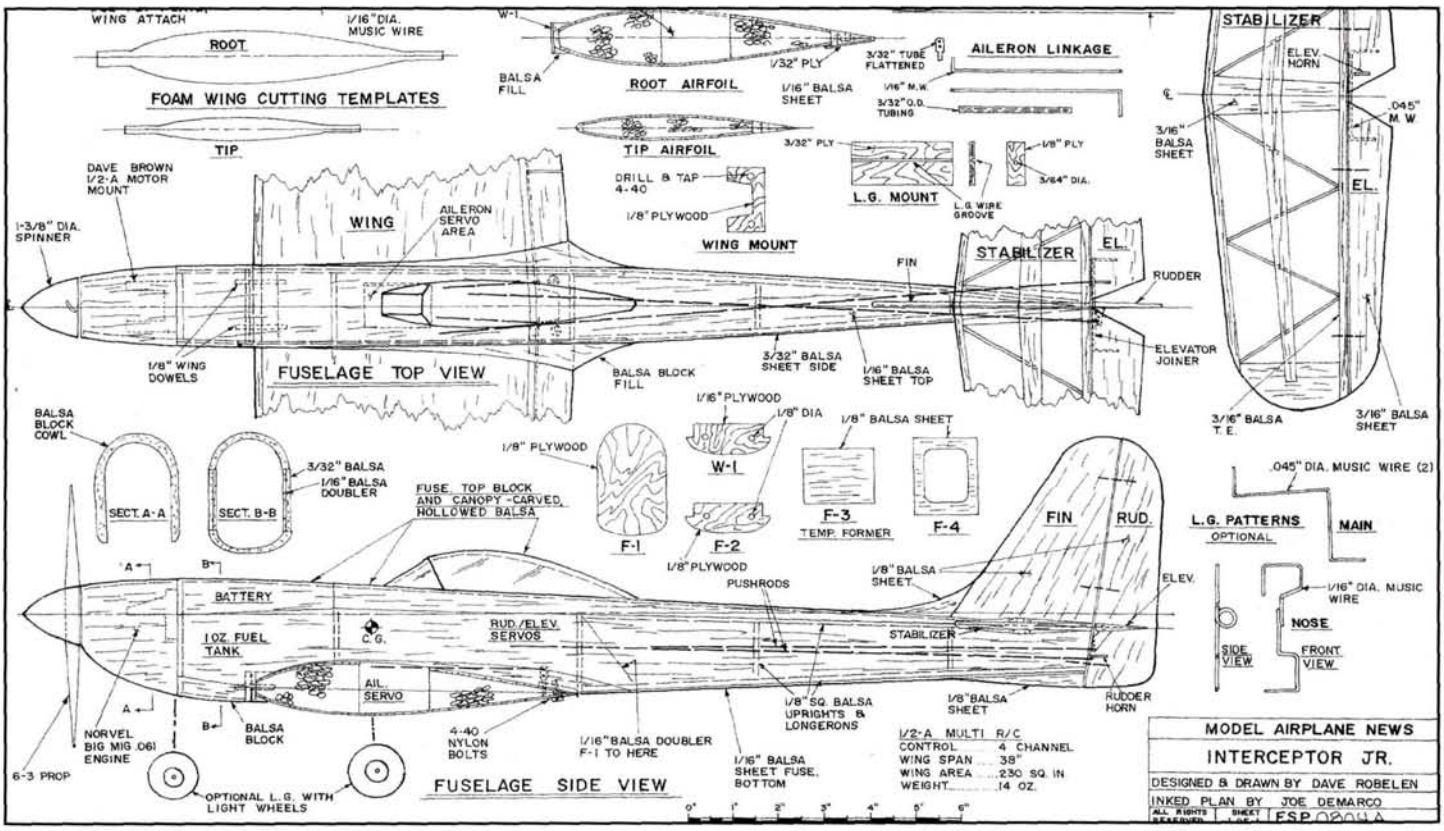
Rocket City *(205) 539-8358.*

Sig Mfg. *(800) 247-5008; (641) 623-5154; sigmfg.com.*

Top Flite Monokote; *distributed by Great Planes Model Distributors; top-flite.com.*

INTERCEPTOR JR.
FSP0804A

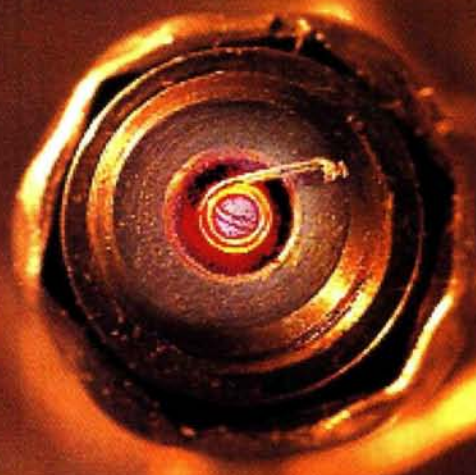
A ½A version of Pappy deBolt's 1964 classic aerobatic pattern design, Dave Robelen's Interceptor Jr. features a traditional balsa fuselage and foam wing construction. The lightweight model has excellent aerobatic performance and can be flown with or without landing gear. WS: 38 in.; L: 17 in.; power: ½A glow (.049 to .061); radio: 4-channel; 1 sheet; LD 2. **$14.95**



To order the full-size plan, turn to page 221, or visit rcstore.com online.

GLOW PLUGS exposed

Coming out of the dark



Shortly after the end of WW II, Ed Chamberlin was running a spark-ignition model-airplane engine on souped-up fuel he called "Liquid Dynamite." When he switched off the ignition, he got a surprise: the engine continued to run! After much head-scratching, a question emerged: was the combustion of Liquid Dynamite causing some part of the spark plug to glow red hot, igniting the next air/fuel charge? To test the theory, Chamberlin replaced the plug's center electrode with a coil of nichrome wire. When he passed low-voltage electricity through the coil, it glowed red. On the test stand, flipping the engine over by hand produced an immediate start, followed by normal high-speed operation—without the heavy, bulky and complicated spark-ignition accessories. Was it time for modelers to throw away their ignition coil, condenser, breaker points and onboard batteries? Not yet. Several years of intensive development remained before the glow plug emerged as the ignition system of choice.

BY C. DAVID GIERKE

With the advantage of 20-20 hindsight, I suggest that the glow plug is the most important invention associated with the 70-year production history of the model-airplane engine. In its present form, the glow plug has been produced for more than half a century. Although glow plugs are diminutive and simple in appearance, the science behind their design is surprisingly complex. Numerous magazine articles have been written about glow plugs over the years by authorities such as Nathan Gordon (1940s), Walton Hughes (1950s), Ted Martin (1950s), Bill Netzeband (1960s), Peter Chinn (1960s to '80s) and Clarence Lee (1960s to present); nevertheless, controversy and uncertainty continue concerning how to select and operate them.

As engine tuners, we are required to understand a bit of science and technology associated with the glow plug, along with an ability to observe, listen and analyze how it affects engine operation. Before addressing these issues, let's investigate two glow-plug dilemmas: does your engine need a short- or long-reach glow plug, and will an idle-bar glow plug improve performance?

SHORT- VS. LONG-REACH GLOW PLUGS

Short-reach plugs are intended for smaller engines with thin heads. If you use a long-reach plug in a short-reach head, it would encroach on the combustion chamber. In the days of baffle-top pistons and wedge heads, the plug might contact the piston at top dead center (TDC). With modern flat-top pistons and hemispherical combustion chambers, the extended plug would merely increase the engine's compression ratio and possibly cause pre-ignition due to hot-spot formations on the exposed threads. Conversely, if you use a short plug in a thick, long-reach head, you'll reduce the engine's compression ratio and, possibly, its power. The engine's instruction manual almost always stipulates which plug is required. If in doubt, remove the cylinder head and check how far the plug projects. The bottom of the plug should be flush with the top of the combustion chamber. If you're using an idle-bar plug, no more than the bar should extend into the chamber. If any threads show, change to a short-reach plug. Keep in mind that short-reach plugs can easily strip the threads in the aluminum alloy head, so tighten them carefully! Long-reach plugs are less likely to strip the threads, but they still have the potential to do so. Other than depth of the thread, there is no other significance to a glow plug's reach. Short-reach plugs are generally used in engines of .15ci displacement or less.

IDLE-BAR GLOW PLUGS

Idle-bar glow plugs are intended for use with engines that are equipped with throttles. While idling, 2-stroke engines have a tendency to form a pool of liquid fuel in the crankcase; this is called "loading." When the throttle is snapped open, the puddled fuel rushes through the cylinder transfer ports, impinging on the wire element of an unshielded plug and instantly quenching it. In theory, the idle bar is designed to deflect the stream of liquid fuel away from the plug's element. If your engine experiences a rich, erratic idle and/or a rich "flameout" during transition to wide-open throttle (WOT), try an idle-bar plug. If an engine doesn't need to be throttled (e.g., in certain racing events), it doesn't need an idle-bar plug. Idle bars protrude into the combustion chamber, disrupting normal flame propagation

and potentially causing pre-ignition. Pre-ignition, a combustion defect, can originate from hot spots that form on the edges and corners of the idle bar and cause the air/fuel mixture to ignite earlier than intended. (See sidebar, "The idle-bar glow plug: treating the effect.")

TEMPERATURE RATING AND SELECTION

That's it for the preliminaries. Glow-plug temperature rating and selection are more complicated and more difficult—but not impossible—to understand and to master. As I see it, there are six parts to the question:

With the cylinder head removed from the engine, the long-reach standard glow plug should be flush with the upper surface of the combustion chamber (as shown).

1. How does the glow-plug engine ignite fuel?

Crankcase-scavenged 2-stroke glow engines have relatively low compression ratios, averaging between 7:1 and 9:1 with an alcohol (methanol)-dominated fuel blend. Methanol's ignition temperature (725 degrees F) cannot be reached by the engine's compression alone; something else is needed to attain this temperature. Note: the maximum possible temperatures at compression ratios of 7:1, 8:1 and 9:1 are: 692, 755 and 815 degrees F, respectively; because there are losses associated with compression leakage and heat transfer to the cylinder wall and head (plus other factors), these theoretical temperatures are never realized. Here's where the glow plug comes into play. For engine startup, electric current is passed through the plug's coiled-wire element, causing it to incandesce (glow) orange-white, producing a temperature in excess of 1,500 degrees F. When the engine is cranked over by hand or with an electric starter, the air/fuel mixture ignites in the combustion chamber. If the mixture ratio is within the range of combustibility, the engine will continue to fire, becoming self-sustaining. When the starting battery is removed, the plug element continues to glow and the engine continues to run.

With the drive washer, prop washer and shaft nut removed from this antique Ohlsson & Rice .23 spark-ignition engine, you can see the interior of the ignition-timer mechanism. By the mechanical action of a cam that's machined onto the crankshaft inside the timer housing, a movable electrical contact opens and closes against a stationary contact. By moving the timer lever that's attached to the timer housing, the engine's ignition point (spark) may be advanced (lever moved up) or retarded (lever moved down) in relation to TDC.

2. How do glow plugs work?

Glow-plug ignition of the air/fuel mixture is controlled by three factors: combustion, catalytic action and compression. Combining the first two factors produces an element temperature that's high enough to ignite the engine's compressed air/fuel mixture, providing sustained (cycle-to-cycle) operation.

Heating the coil via combustion causes the glow-plug element's temperature to soar to over 1,500 degrees F. Although it cools rapidly, a significant portion of this temperature is carried over to the next cycle.

When alcohol vapor interacts with platinum (silver-white metal), an exothermic (heat-release) reaction takes place.

Turning the compression adjustment lever clockwise (as viewed from the top) increases this model diesel engine's compression ratio; turning it counterclockwise lowers the compression.

Acting as a catalyst, platinum is not physically changed by the reaction, but its temperature increases. Therefore, the platinum-alloy wire element experiences a further increase in temperature as the vaporized air/fuel mixture is transferred into the cylinder and during compression. (Note: due to platinum's brittle state at high temperatures, a platinum-iridium or platinum-rhodium alloy is used to improve element longevity.)

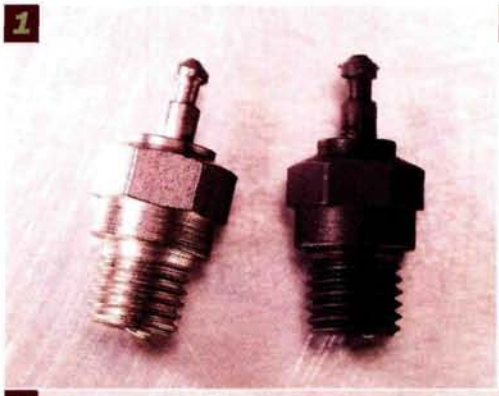
Although the glow engine's compression process cannot raise the temperature of the plug's wire element to the ignition point for methanol-based fuel, it still has an important role to play. By compressing the gaseous air/fuel mixture, its internal energy (heat) is increased; heating speeds up the motion of reactive molecules and produces something we call "compression condition-

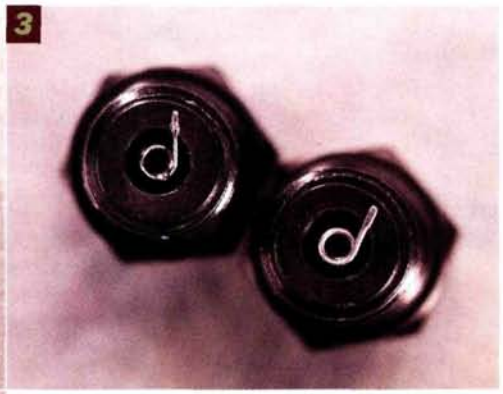
ing." The thermal theory for ignition suggests that burning starts only when the gaseous mixture becomes hot enough, and the molecules collide often enough. Some of these collisions result in an ignition reaction at the glow-plug element.

3. Why do we need glow plugs with different temperature ratings?

Some call the glow-plug engine a fixed-ignition-point design, but nothing could be further from the truth.Unfortunately, this myth confuses the glow-plug temperature-rating issue; sweep it from your mind.

Spark-ignition engines control ignition-point timing with a mechanical or electronic advance-and-retard system. Crankcase-scavenged model diesel engines control ignition timing by mechanically adjusting the compression ratio through a movable head known as a "contra-piston." Although adjusting the glow engine's ignition-point timing isn't as obvious, it happens regularly by changing variables such as the propeller load, nitromethane content, lubricating oil content, compression ratio and glow-plug temperature rating. The engine's mechanical condition, and even weather conditions, play a role. We adjust an engine's ignition point to attain the optimum peak-pressure point ("sweet spot") after TDC that ultimately produces the best engine performance and longevity. Changing glow plugs within the "hot to cold" range is often the first adjustment made to an engine's ignition point.





1. This is the Merlin glow plug type 2001; it features a nickel-plated plug body and a cold rating. The type 2005 has black-oxide plating and a hot rating. Merlin offers several other plugs with temperature ratings ranging from very cold to very hot. 2. The nickel-plated Fox Standard long plug is rated medium. The nickel-plated Pro Series no. 8 is rated cold. The no. 8 plug has the smaller cavity diameter. Fox, a longtime manufacturer of glow plugs, has many other reaches and temperature ratings that include: Std. Long (hot); Std. Short (medium); and Std. Short (hot). 3. The black-oxide-plated Novarossi C4-S plug is rated hot. The black-oxide-plated C8-S is rated very cold. The only discernible difference between the two is the diameters of their wire elements; the C8-S's element is thicker. Novarossi also offers a C5-S (cold), C6-S (cold) and a C7-S (very cold). 4. The nickel-plated O.S. A3 plug is rated hot; the nickel-plated no. 8 is rated cold, and the black-oxide-plated R5 is rated very cold. O.S. also offers an A5 plug that is rated medium. 5. The nickel-plated Enya no. 3 plug is rated hot; the nickel-plated no. 6 plug is rated cold. Notice the thicker wire element in the no. 6 plug. Enya also offers a no. 4 plug that is rated hot and a no. 5 that is rated medium.

4. How does a glow plug's temperature rating change the engine's ignition point?

"Heat range" isn't the best term to describe what transpires within the glow plug. Outside the world of science and technology, words such as "heat" and "temperature" are often used interchangeably; unfortunately, however, they don't have the same meaning. Without belaboring the point, I'll just say that I prefer to use the term "temperature rating," which is more scientifically correct for describing how the glow plug advances or retards an engine's ignition-point timing. As long as you understand that the traditional words "hot" and "cold" actually refer to temperature, you can call the phenomenon anything you wish! There are times when "hot" and "cold" are less clumsy to use.

Example: assume that a "hot" (high-temperature-rated) glow plug has replaced a "cold" (low-temperature-rated) plug. How does this affect the engine's ignition-point timing? The ignition point advances; that is, it occurs earlier in the compression event. Why does this happen? During normal engine operation (with the starting battery removed), the "hot" plug's higher element temperature allows the compressing air/fuel mixture to arrive at its ignition temperature before that of the "cold" plug. Recall that plug-element temperature is the result of combustion temperature and catalytic action temperature, with compres-

GLOW PLUGS exposed

SPECIAL GLOW PLUGS

Nelson plugs. In the late '70s, control-line speed flier Carl Dodge modified a GloBee plug into the first two-piece chamfer-nose (angled) design. Although the new design produced superior engine performance compared with conventional ¼-32 plugs, the reason for this increase remains unclear. The problem with the ¼-32 plug seems to be associated with its screw threads being exposed to high-pressure combustion gases, all the way to the sealing washer. Dodge's two-piece plug differs from the conventional glow plug in terms of fastening and combustion-gas-sealing methods; when the threaded retainer sleeve is screwed tightly into place, the chamfered nose of the element body matches a similar surface within the head, producing a sealed and seamless transition with the combustion chamber.

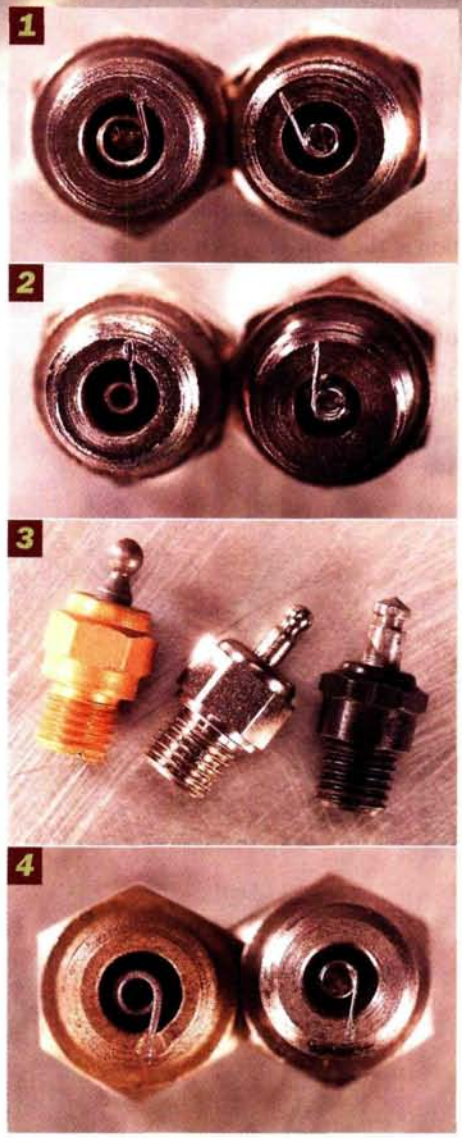
In the early '80s, Henry Nelson was the first to offer a one-piece plug that incorporated a chamfered nose to match an angled seat within the head, as with Dodge's design. As before, the gas seal occurs before the fastening threads. Today, these chamfer-nose units have 11/32-32 threads and are known to airplane-racing enthusiasts as "Nelson plugs" and to RC car modelers as "turbo plugs." In conjunction with Ohlsson, the assembler, Nelson also produces a version of the original GloBee two-piece plug for various speed and racing competition events.

Above, left to right: Nelson's two-piece, GloBee-type, chamfered-nose plug closely resembles the original Carl Dodge innovation of the late 1970s; it's available in STD (standard), heavy STD and with a heavy (cold) coil. The one-piece, chamfered-nose Nelson plug is the granddaddy of all "turbo" plugs; the STD is rated medium. Henry Nelson also makes an HD (heavy duty) that's rated cold. The nickel-plated plug with the relatively small nose chamfer is the O.S. P6 "turbo" (hot). O.S. also makes a P7 (medium) and a P8 (cold). The black-oxide-plated plug is a Novarossi "Turbo Ultra" (C8TGF) that's rated very cold. Novarossi also makes a C7TGF (cold) and a C6TGF (medium).

4-stroke plugs. Four-stroke cycle engines are required to retain their plug-element temperatures throughout the exhaust and intake strokes before entering the compression event and the next ignition point. To accomplish this, 4-stroke plugs must have a very high temperature rating. In 1977, O.S. was the first to successfully incorporate a glow plug (type F) into a mass-produced 4-stroke cycle engine: the revolutionary FS-60 single-cylinder design.

Most 4-stroke glow plugs are characterized by an extended nose projecting into the combustion chamber. Because of their location, the nose and wire element are exposed to higher temperatures than a standard plug, extending their useful temperature to the next ignition point.

Special glow plugs for 4-stroke engines (left to right): the O.S.-F plug is the granddaddy of all 4-stroke glow plugs and the originator of the extended-nose concept of temperature retention; the Merlin "Hosenose" plug incorporates interesting internal cavity dimensions and element design; Enya's latest entry features traditional technology.



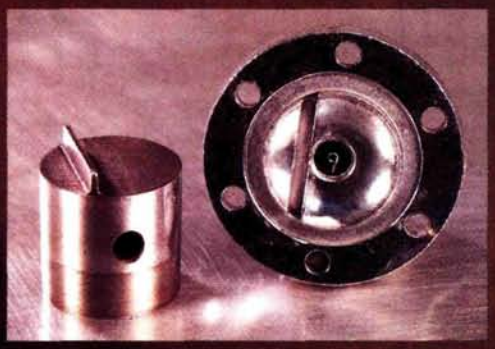
1. The number of coils within the plug cavity represents the total length of the element wire. Note the single coil (left) compared with the multiple-coil element. 2. The size of the element cavity affects the plug's rating. The small cavity (black-oxide plug) helps reduce the temperature rating; the large cavity (nickel-plated) helps increase the temperature rating. 3. The type of plating used for the plug body helps control the temperature of the element wire. Nickel plating reflects heat (infrared radiation), and that helps retain the element's temperature. Black-oxide plating absorbs heat, so it helps reduce the element's temperature. The qualities of Rossi's copper-plated R.A. (cold) plug fall somewhere between those of nickel-plated and black-oxide-plated plugs. 4. The diameter of the plug's wire element helps to determine its temperature rating. Smaller-diameter wires tend to increase the element's temperature, and larger-diameter wires tend to reduce its temperature. Larger-diameter wire is more durable than small-diameter wire—an important glow-plug design factor when you use fuel that has a high nitromethane content in high-performance engines.

sion conditioning of the air/fuel mixture acting to initiate combustion. The opposite happens when a "cold" plug replaces a "hot" plug; the lower temperature of its wire element requires more compression conditioning of the air/fuel molecules to reach its ignition temperature. This takes place closer to TDC and therefore acts to retard ignition-point timing.

With dozens of glow-plug brands available on the world market—each offering a range of temperatures—incremental changes to the engine's ignition-point timing can, theoretically, be made. Later, we will investigate the promise and the reality of "sweet spot" engine tuning by glow-plug temperature rating.

THE IDLE-BAR GLOW PLUG: TREATING THE EFFECT

Early cross-scavenged 2-stroke engines were equipped with piston baffles that deflected fresh air/fuel mixture toward the glow plugs, making them susceptible to element quenching during idle and throttle-up. The common boost-transfer-port variation of the modern Schnuerle-ported engine often exhibits this same problem.



Older (cross-scavenged) engines were susceptible to plug quenching during idle and throttle-up, due to transferred air/fuel mixture being directed toward the wire element by the piston baffle.

The idle-bar plug is a stopgap measure that treats the effect rather than the cause of element quenching. Plug-element quenching results from poor mixture control during throttle-down/throttle-up and idling, in addition to the engine's inability to keep fuel vaporized in the crankcase. Simple model airplane engine carburetors are not up to the task of maintaining the correct air/fuel ratio throughout its range of throttlability. Complex automotive-type carbs couldn't do it; that's why the auto industry moved to fuel injection when solid-state electronic technology became available.

An important—and often overlooked—factor concerns fuel vaporization in the crankcase. Vaporized fuel mixed with available air is in the best possible physical state (a gas) in preparation for combustion. If all the fuel is vaporized, crankcase "loading" and plug-element quenching would not occur. Unfortunately, methyl alcohol requires a lot of heat to change from a liquid state to a gaseous state, so the engine's crankcase quickly cools and thus limits the fuel-vaporization process while forming a pool of liquid fuel. One solution to this dilemma is to heat the crankcase, but this severely reduces the engine's ability to transfer a dense mixture charge into the cylinder. Although inconsequential at partial throttle, wide-open-throttle performance suffers greatly, with a 20- to 25-percent reduction in brake horsepower. Someone should invent a crankcase heater that works only when the engine is throttled, so we could throw away the inefficient idle-bar glow plug! While we're waiting, avoid directing cool air over the crankcase (below the cylinder fins) of your cowled 2-stroke engine; this promotes crankcase loading.

Above: this Super Tigre fuel-metering (twin-needle valve) carburetor illustrates a major technical advance in controlling the engine's air/fuel mixture during idle and throttle-up during the 1960s. Despite improvements in carburetion, crankcase-loading and plug-element-quenching continue to plague RC engines. Left: modern engines use Schnuerle transfer ports (usually two) and a third boost port. The boost port is usually angled toward the head causing plug-quenching problems during idle and throttle-up, similar to the baffle-piston configuration.

5. How do manufacturers make glow plugs "hot" or "cold"?

A plug's temperature rating depends on many factors, including:

- Element alloy specifications: platinum iridium or platinum rhodium; alloy percentages.
- Element dimensions: wire-gauge size, length, coil diameter, number of coils.
- Plug cavity and geometry (e.g., diameter and depth).
- Position of element in cavity.
- Plug body finish: reflective or absorbing.

The platinum-alloy element is usually the focus of attention when enthusiasts discuss a plug's temperature rating. The conversation often goes something like this: "This plug has a thick wire element, and it doesn't have many coils, either; it's a cold plug." This is likely, but many other factors contribute to a plug's temperature rating. My friend Clarence Lee once wrote:

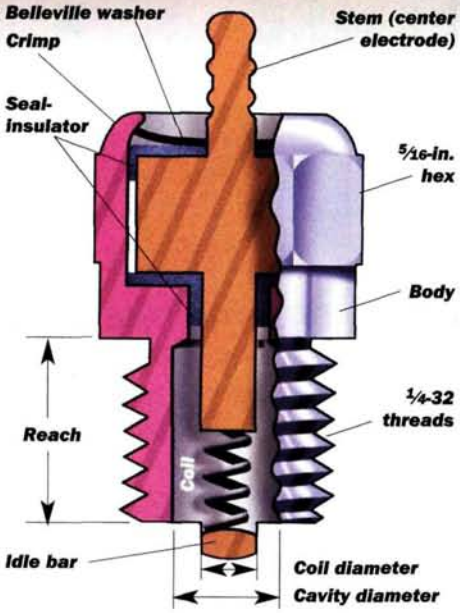
"As simple ... as the glow plug appears to be, it is actually more complicated than you might believe. You can't just stick a piece of platinum wire in the machined body and expect it to work. I had a hand in the development of the old Veco glow plug and can speak with some authority on this. You can completely change the characteristics [temperature rating] of a glow plug by using either a black-oxide or nickel-plate finish. With all of these variables, just think of all the possible combinations you can come up with for experimentation."

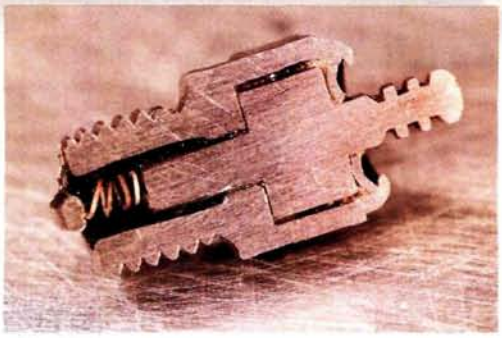
The difficult part of glow-plug design comes with assigning a value to each variable; things change when the variables interact! By modifying the plug's finish, how much will its temperature rating change? What about the length of the element wire in relation to the diameter of the element cavity? How about the thickness of the element wire compared with the number of coils, etc., etc.? Although no single factor determines a glow plug's temperature rating, some generalizations can be made:

- A small-gauge element wire tends to raise the plug's temperature rating.
- A small-diameter plug cavity tends to lower the plug's temperature rating.
- A reflective finish (nickel plating) within the plug cavity raises the temperature rating.
- An absorbing finish (black oxide) within the plug cavity lowers the temperature rating.
- Extending the element coil beyond the plug body elevates the temperature rating.
- Pushing the element into the plug cavity lowers the temperature rating.

GLOW PLUGS exposed

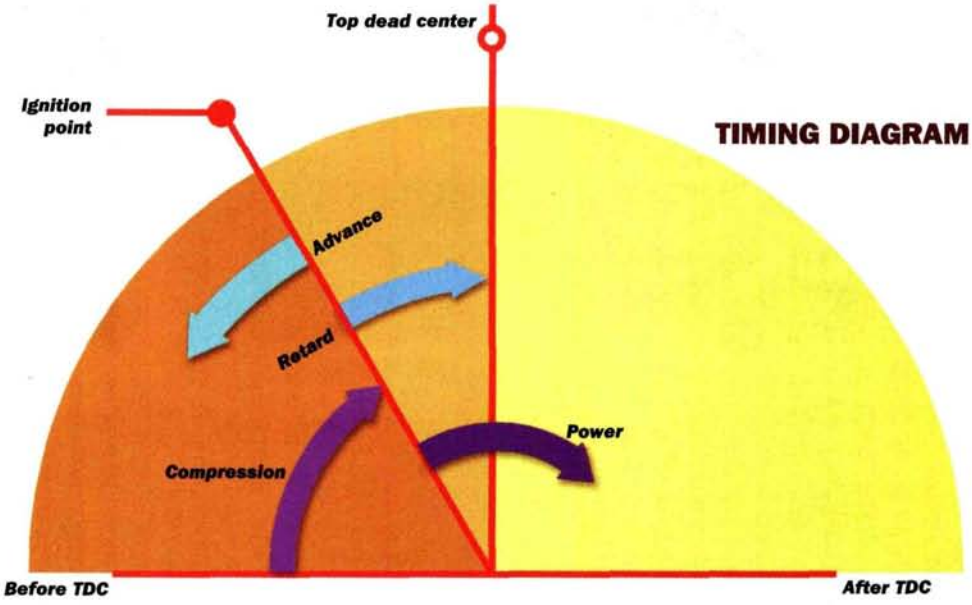
GLOW-PLUG CUTAWAY



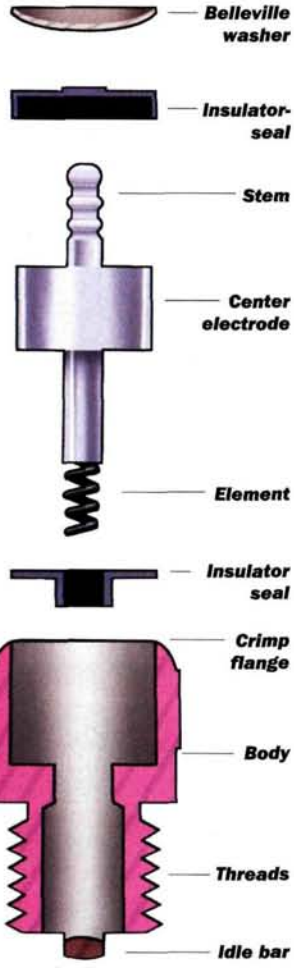


Left: typical glow-plug cross-section. Plugs' designs, materials and fabrication techniques vary with their producers.

TIMING DIAGRAM



GLOW PLUG EXPLODED-PARTS VIEWS



Thermodynamics research engineer Frank Vassallo says, "There are some very complex interactions taking place inside a glow plug." I think you get the picture. At the risk of offending glow-plug designers and manufacturers, there are no glow-plug experts. Glow plugs represent a form of black art, where empirical knowledge (trial and error) reigns supreme. In the end, determining the engine's ignition point in relation to TDC is probably the best method of evaluating a glow plug's relative temperature rating; more about this in part two.

There are other design considerations besides the glow plug's temperature rating. The physical dimensions of the wire element determine the voltage that must be applied to the plug to achieve white-orange incandescence for engine startup. There are also issues of element attachment, electrical insulation, center electrode retention and high-pressure gas sealing.

Next time, I'll discuss question 6: how to select a glow-plug temperature rating for your engine. I'll also describe how to "read" a glow plug, give solutions to common problems, and more. We're just getting started! Now, how many of you would have thought that a tiny glow plug could be so complex? See you next month.

Enya; distributed by MRC (732) 225-2100; modelrectifier.com.

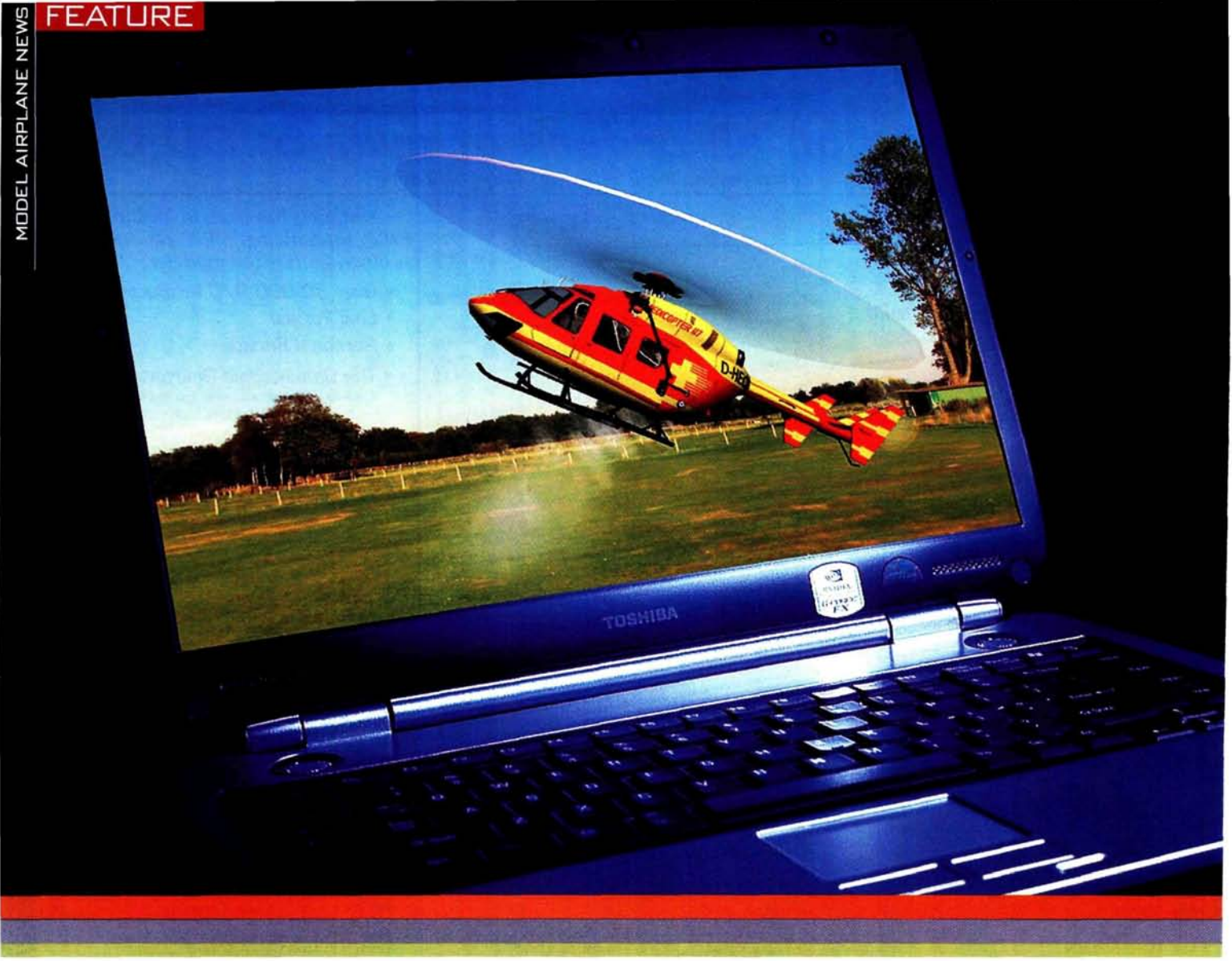
Merlin (708) 246-3730; merlinglowplugs.com.

Nelson Competition Engines (412) 538-5282.

Novarossi; distributed exclusively by Trinity Products Inc. (732) 635-1600; novarossi.com.

O.S.; distributed by Great Planes Model Distributors (217) 398-6300; (800) 682-8948; osengines.com.

Rossi; distributed by Morris Hobbies (800) 826-6054; (502) 451-0901.



MRC REFLEX XTR FLIGHT SIMULATOR

by John Reid

PRACTICE MAKES PERFECT!

Flight simulators have become an integral part of RC flying. They are excellent tools for those who are just learning how to fly, and they save users money by allowing them to crash virtual airplanes instead of real models!

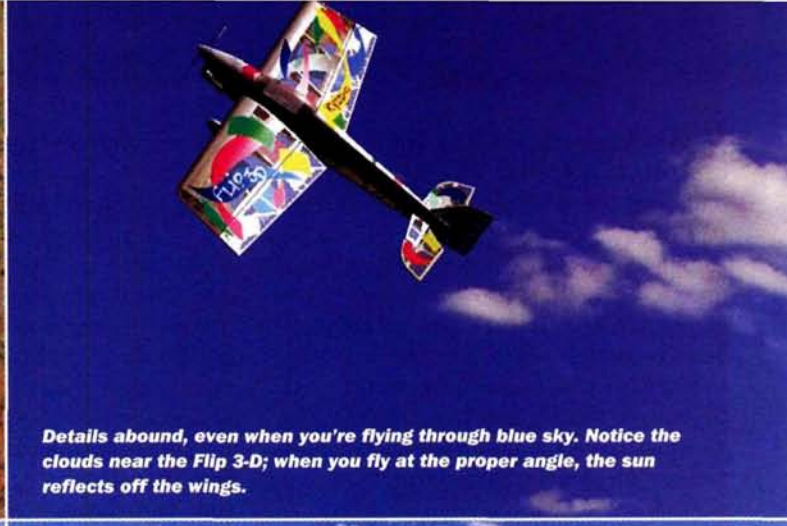
In addition to their usefulness for beginners, flight sims are a boon to experienced fliers who use them to keep their thumbs nimble during the cold winter months when outside flying isn't practical. Expert pilots also use sims to learn new maneuvers and to practice their routines for competition. One of the newest, the Reflex XTR, is now available from MRC, and it's one that pilots of all skill levels will enjoy.

A NEW BREED OF FLIGHT SIM

The Reflex XTR flight sim was designed using photographs of actual flying fields and model aircraft that you can select to fly. The package includes a CD with the program on it and an interface USB adapter cable for your favorite transmitter. Using your own transmitter on a sim gives you the same control feel for the simulated model as you have for your real model.

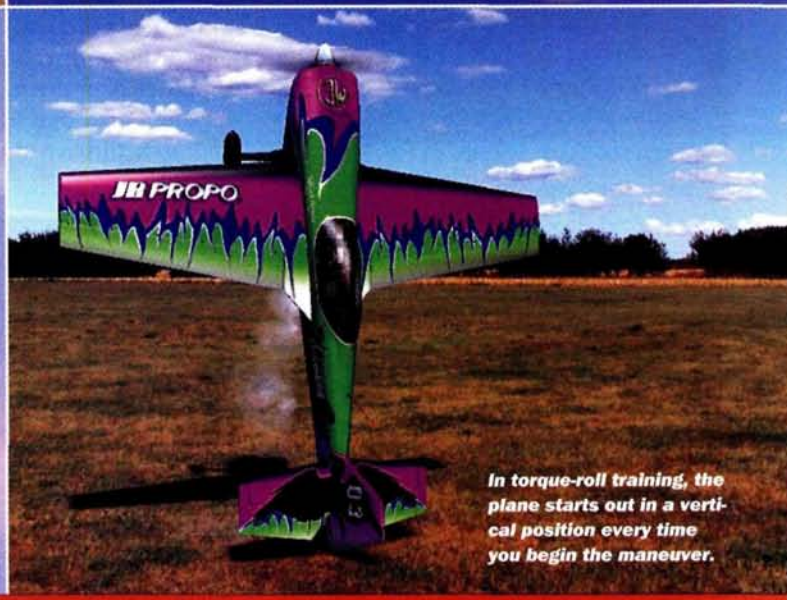
After you've installed the program, simply plug your transmitter into the computer using the interface USB adapter cable, and you'll be ready to go. When you start the Reflex XTR program, a pop-up menu

This flight sim's attention to detail is evident throughout; in this ground shot of the Breitling Eagle, you can see details such as the plane's shadow and blades of grass.



Details abound, even when you're flying through blue sky. Notice the clouds near the Flip 3-D; when you fly at the proper angle, the sun reflects off the wings.

In the XTR sim, when your plane flies into the sun, it's silhouetted against the sky—just like in real life, but without your having to squint to see it.



In torque-roll training, the plane starts out in a vertical position every time you begin the maneuver.

asks you to center all trims and control sticks on the transmitter for calibration. When you've done this, the program opens with a picture of a plane sitting on the runway; it is now ready for your flight inputs. Before taking off, be sure to assign the transmitter channels to their proper control surfaces by going to the radio menu and selecting Assign Channels or pressing the F7 key.

Once you've started to program, you can use the extensive instruction "manual"; just click on the Help button at the top of the screen. Formatted like a Web page, the manual is extremely easy to navigate and can also be printed if you want a hard copy.

RUNNING THE PROGRAM

After I had loaded and launched the program, I was immediately impressed by the scenery and airplane graphics. Because of their realistic shadows and lighting, I almost felt as though I were standing at a flying field at midday and ready for my first flight. I started the simulation by pressing the F4 key, and the aircraft's ground handling also closely duplicated reality. If your plane rolls off the runway's short grass, you'll feel additional drag on the wheels as the plane is slowed by long grass. Once airborne, the sim plane's flight characteristics are very true to what you expect when you're actually flying a model; when you fly around the field, the direction of the light changes as it does during an actual flight. All of the objects in the scenery interact with the model, so collisions are a real possibility if you fly too close to them. You can also fly around and behind ground objects.

This is something you should try to avoid, but if you're going to crash, a simulator is the best place to do it!

Because of the graphics' high demands on your PC, some computers might not be able to run the program smoothly with the photo-based backgrounds (see the "Specifications" sidebar). If your computer balks, switch to the Reflex scenery with Selectable Pilot Position. This offers a wide selection of variables such as rain, fog, clouds, sun and sunset that you can add to your flight sim. You can even adjust the length of the grass, the density of the trees, the type of terrain, the number of structures and some orientation aids (see the next section).

NOVICE PILOTS

The Reflex XTR simulator offers a vast selection of learning tools to help new

pilots advance their flying skills. Novices can first concentrate on developing the hand/eye coordination necessary for controlling RC aircraft without risking an actual RC aircraft, thereby saving time, money and "the agony of defeat." The Reflex XTR accurately reproduces the handling characteristics of a model as it taxis over a variety of surfaces, e.g., short grass, pavement, tall grass. If you aren't careful to apply the right power/elevator combination, the plane will nose over.

specifications

PRODUCT: Reflex XTR flight simulator

DISTRIBUTED BY: MRC

MINIMUM SYSTEM REQUIREMENTS

- 1.2GHz PC Pentium 4 processor
- 256MB RAM
- 1GB available disc space
- DirectX 8.1-capable 3D hardware accelerated video card with at least 32MB video RAM (AGP2x or better; shared RAM is not supported)
- CD drive
- USB port
- RC transmitter with student or DSC socket and at least 4 channels
- Windows 98/98SE/ME/2000 or XP operating system

NOTE: the interface was tested with the standard available transmitters. Some transmitters may require extra equipment such as a student cable.

PRICE: $234.98 (includes simulator, interface cord and USB adapter)

FEATURES: the program includes 18 types of fixed-wing planes from scale to fully aerobatic; the 17 helicopters range from large aerobatic performers to small, hand-held models. With the Reflex model editor, you can design and tailor the looks and performance of any aircraft. You can choose from among five realistic flying fields and one computerized flying site and a vast array of flying conditions. The 10 training modules can really help you improve your skills in helicopters and planes.

HITS

- Excellent graphic realism.
- Realistic flight performance and feel.
- Easy installation and a very detailed electronic manual.

MISSES

- None.

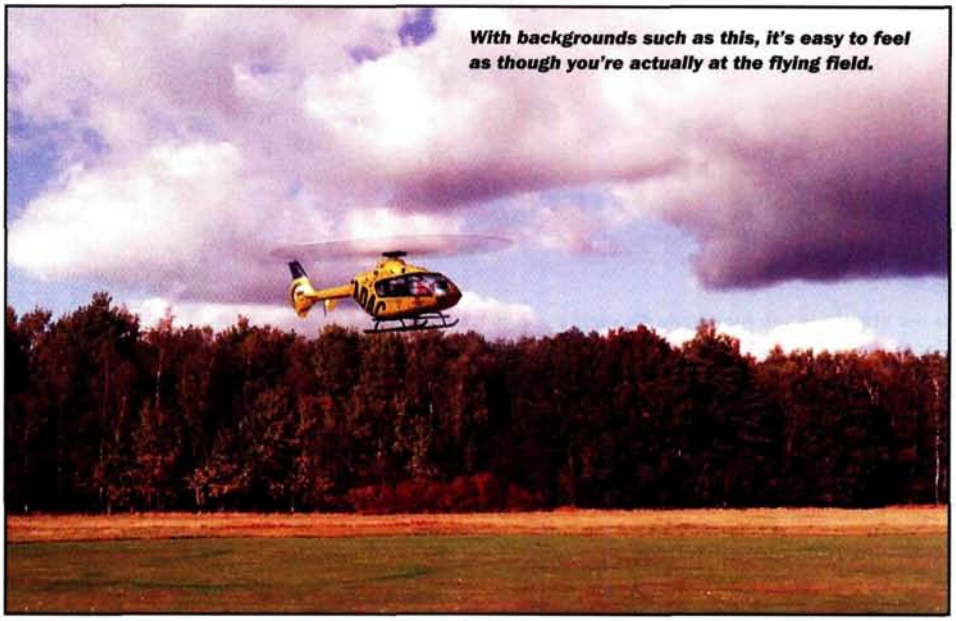
For many new pilots, flight training at the field begins with the instructor's handling the takeoff and getting the plane to a safe altitude before turning control over to the student. The Reflex simulator can duplicate this by having the plane begin at a specific altitude every time. As the novice develops his flying skills, he can change that to make the plane start at the end of the runway so he can practice taking off. To practice landings, you can program the plane to start at a designated altitude and distance away from the runway and then practice landing approaches repeatedly until you perfect them. With a simple click of the mouse button, you can have a dotted line trace a typical landing approach through the sky—a great teaching aid.

INTERMEDIATE FLIERS

The Reflex XTR offers typical weekend pilots an easy way to hone their skills without having to leave the house. There are a number of flight-training extras such as flying into a strong wind and into glaring sunlight and having to deal with engine failure. Better to learn on a sim than to crash your model! Among the wide variety of simulated weather conditions, I found that the fog was as real as it could be.

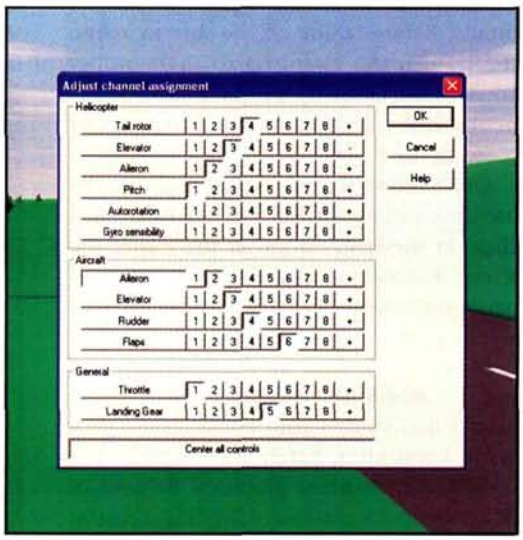
The ability to practice new maneuvers is probably one of the best reasons to use a flight sim, and the Reflex XTR offers a good selection of aerobatic planes. To this end, the program offers two training modes:

• **Torque Training.** This starts the plane in a vertical hover and lets you focus on



With backgrounds such as this, it's easy to feel as though you're actually at the flying field.

Below: pulling barnstorming maneuvers is pretty easy when you actually have a barn in the scene! All scenery details are interactive, and you can crash into them.



Above: from this menu, you can choose which functions you want to run on which channels. Control surfaces are assigned to the corresponding channels for both aircraft and helicopters.

atomic Digital Technology

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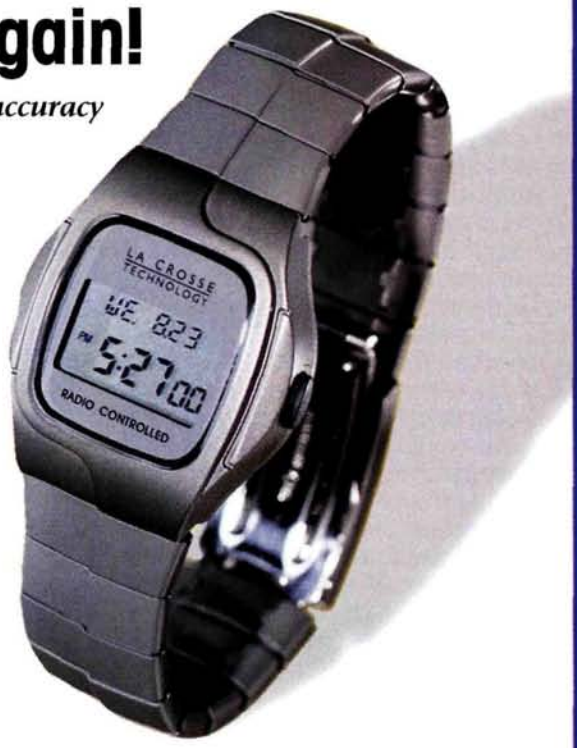
Atomic digital watches keep absolute time and date accuracy by tuning in to the official time transmitter.



The world has become a smaller place in the past few decades. Transactions take place across the world in an instant. Having a timepiece that can not only keep perfectly accurate time, but also keep track of the time zones can be really helpful and convenient. Now there is a watch that scientifically gives the right time in all zones within a 2,000 mile range of the F-1 Fountain Atomic Clock.

If you travel this watch is a necessity. The Atomic Digital Watch from LaCrosse Technology is radio-controlled, maintaining its incredible accuracy by automatically tuning into the official standard frequency and time transmitter in North America. This WWVB radio signal gets its time from the most precise clock in North America based in Colorado, and transmits its signal over a 2000-mile range. With the press of a button, the Atomic Digital Watch gives you a selection of 24 time zones, from GMT+12h to GMT-12h with special U.S. time zones displayed with three characters (ATL, EST, CST, MST, PST, ALA, and HAW). This ultra-accurate radio-controlled timepiece has a perpetual day and date calendar, signal reception indicator and is powered by a 3-volt lithium battery expected to last up to three years.

Radio wave technology

Does anyone really know what time it is?
Well, the U.S. Government wants to, so they created the National Institute of Standards and Technology, a component of the U.S. Department of Commerce. The Time and Frequency Division, located in Boulder, Colorado, maintains the F-1 Fountain Atomic Clock, the nation's standard of time. This clock neither gains nor loses a second over a 1 million-year period. This clock is used to create an international time scale, which NIST distributes through its radio stations.

Wrist-worthy. Now, advanced Radio Frequency (RF) technology is featured in a wrist-worn timepiece for use at home, at the office or on the road. This watch is the next best thing to having your own atomic clock, because it automatically displays the precise accurate time thanks to its improved radio-signal reception. With a 12 or 24-hour time mode capability, it automatically adjusts itself for daylight saving time (with an "OFF" feature) and leap years and it features a variety of practical and convenient features to fit your lifestyle.

A timely gift. The stainless steel butterfly clasp and removable links to adjust the band size make it a good fit. The specially designed casing allows for optimal radio-signal reception. This watch is a great gift for anyone who values precision and technology.

Try it for yourself. Advances in electronic technology let you get precise timekeeping at an affordable price. Now, thanks to a factory-direct relationship with the manufacturer of the Atomic Digital Watch, you can try it for yourself with TechnoScout's exclusive home trial. Try this product for 60 days and return it for the product purchase price if not satisfied.

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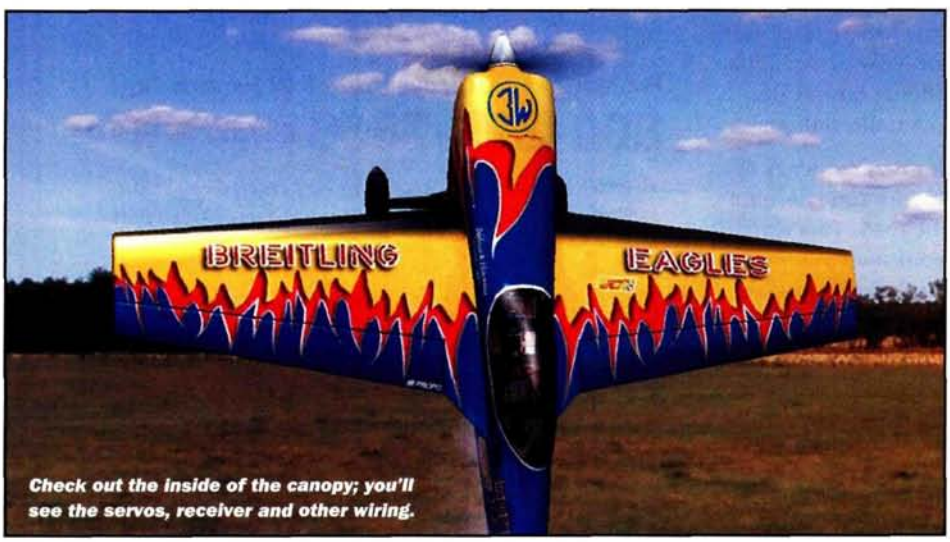
hone your heli skills

The MRC Reflex XTR's realism is carried over to the world of simulated helicopter flight, too. You again use your own transmitter into which you've already programmed all of your heli's parameters. The program offers 17 helis, and you can modify every one or create your own virtual copter. A wide array of available modifications allows you to alter every aircraft's aerodynamics and capabilities. You can even modify their appearance to make a hot performer look like a clunky old trainer!

The Reflex XTR allows you to practice hovering and flying on a sunny, rainy, or foggy day, at sunset and even in wind. The training mode offers various situations to help you prepare for any problem you may encounter while flying a chopper. You can repeat the autorotation exercise endlessly until you are completely comfortable with it. In this training mode, you can start the helicopter at a designated altitude so you can practice autorotations right away. The sim reproduces the experience of flying a heli into the sun. You can modify the frequency of tail-rotor and engine failure during flight, and all of these training exercises will really help you to sharpen your flying skills.

For those who want to get into helicopters, the Reflex XTR flight sim offers an excellent training program. Hover training allows pilots to begin by controlling one function, such as the roll cyclic (ailerons) while the computer maintains the stability of all the other controls. When you've mastered one control, you can move on to mastering two and so on until you can hover using all four control inputs. This is a great way to learn how to fly a helicopter.

Once you've mastered hovering in one position, you can try the more demanding Promenade part of the hovering program. This simulates the practice of walking around the helicopter while trying to maintain a defined hovering position with the nose pointing in one direction. As a result, you'll learn how to control the heli from all directions and orientations.



Check out the inside of the canopy; you'll see the servos, receiver and other wiring.

In the hover training, you can practice controlling the heli in a stable hover by selecting one control function at a time and then moving on to the next control function after you've mastered the previous one.

one control (throttle, for example) while the computer takes over all the other controls. When you've mastered keeping your plane in one position, you can add another control. As your hovering skills improve, you can continue to add controls until you can hover in one spot using throttle, elevator, rudder and ailerons.

After you've mastered the torque hover, you can move on to the second training mode:

• **Promenade.** In this mode, you seem to be walking around the plane and viewing it from all possible angles. This requires different control inputs as your position changes. I found this training mode quite difficult.

EXPERTS

Pilots who compete will truly appreciate the accuracy and feel of the Reflex XTR. You can practice planned flight maneuvers repeatedly until they are perfect and vary the weather so that you'll learn to fly in any condition. You can even design a plane to look like your competition aircraft, so you'll have the advantage of practicing with a plane that behaves and feels like your actual model.

You can adjust all of the airplanes' characteristics, physical parameters and general data, such as the efficiency of the ailerons, elevator and rudder and lift performance; you can even adjust engine sounds and how each model looks. Because you can alter everything on the simulated aircraft, it is relatively easy to design a virtual plane that performs just like your real competition model.

CONCLUSION

MRC's Reflex XTR flight simulator has something for everyone, regardless of flying ability. For helicopter and fixed-wing fliers, the Reflex XTR offers breakthrough technology that takes virtual flight training to a new level of sophistication. ✈

MRC (732) 225-2100; modelrectifier.com.

FUTABA T7CAP RADIO

It's loaded, and it's affordable!

by Rick Bell

Futaba really struck a chord with modelers everywhere when it introduced the very popular 9C radio system a couple of years ago. It's a low-cost, powerful computer radio that's easy to program, and with Futaba's reputation for reliability, how could it not be a winner?

Futaba realized that some modelers don't need all the features of the 9C, so it developed the new T7CAP/7CHP 7-channel computerized radio system. This radio follows the same basic formula as the 9C; it offers many of the same distinctive elements as its older brother but at a lower cost. I have used most of the radios in the Futaba line and found the 7C versatile and easy to use. Let's take a tour to see what this radio will do.

This view shows the programmable trainer switch (switch F). By connecting the optional trainer cord to a compatible transmitter, the 7C can be the "master" or the "student" radio. You can program the radio to allow different levels of control.

THE BASICS

The T7CAP (7C) is Futaba's newest-generation multifunction, 7-channel system, and it's a big step up from the 6XS 6-channel radio. The 7C has selectable programming for airplanes and helicopters, but it doesn't support glider-specific programming. Futaba notes that most glider functions are overlapped in the airplane programming, and a mix can be set up to establish the desired function.

The switches are programmed to default settings, but they can be reassigned to serve almost any function.

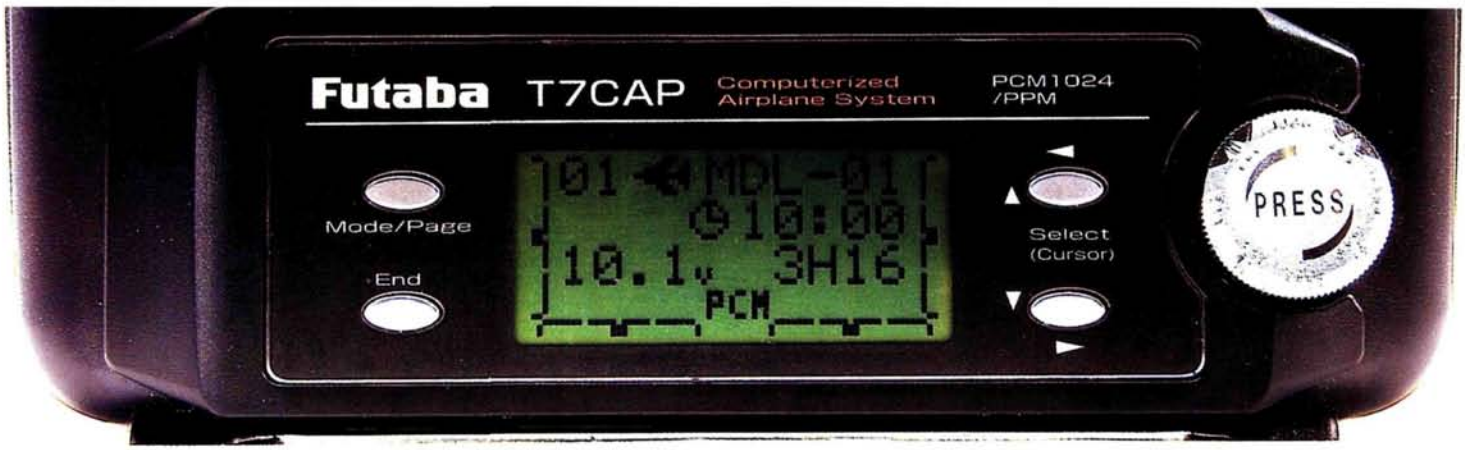
Two transmitter types are available: one designed for airplanes, the other for helicopters. Both transmitters have the same software, but Futaba strategically placed the switches for each model type. One unique feature of the 7C is the ability to change to one of four modes (Mode 1, 2, 3, or 4). By holding down the Mode and End buttons as you turn on the transmitter, a screen that reads "STK-MD" appears; then, rotate the "Dial 'n Key" until the desired mode shows. Turn off the transmitter, and the new mode is active. Note that this does not change the throttle ratchet, which is a mechanical change; you must send the transmitter to a service center to accomplish this.

The 7C has a 10-model memory, and unlike the 9C, there is no CAMPac capability to expand the memory. Frankly, having memory for 10 models is more than enough for most modelers. The transmitter case is made of molded plastic, and the back of the case has raised grips for your fingers to wrap around. There is also a molded-in carrying handle. On the face of the transmitter, there are three switches and a rotary knob; the top of the transmitter has three more switches. They're arranged much like those on other Futaba radios, and all are within easy reach and labeled A, B, C, etc. The control sticks have adjustable lengths and sharp serrated tops, so your thumbs stay firmly seated. The sticks' tension can also be altered to suit the feel you prefer; the manual shows you how to remove the back of the transmitter to make those adjustments.

When you turn on the radio, the home-screen display shows a lot of information. Across the top is the model number, a picture of an airplane or a helicopter (to indicate the program selected) and the model's name. The second line shows a timer that can be set to count up or down. The final line of information contains transmitter voltage and the total time the transmitter has been active. Modulation (PPM/PCM) lies directly below, and the screen is outlined with the positions of the digital trims. I think that Futaba has put just the right amount of information in an easy-to-read format.

INPUT FUNCTIONS

The logic behind the data input is well thought out, and it's easy to find your way around. As is typical for most computer radios, there are two programming menus: basic and advanced. To enter the basic menu after the radio has been turned on, press the Mode/Page button, and the first of three screens will appear. From here, rotate the program dial to quickly scroll to the function you want, or use the Cursor Select button to change screens. When you find the function you want to work with, rotate the dial to place the cursor next to it, and press the dial to enter that function. It's very much like using a mouse on a PC. The advanced menu is accessed through the basic menu by pressing the Mode/Page button; the advanced menu also contains three screens. Scrolling through its screens and accessing the functions works the same way as the basic menu. Pressing the End button at any time will return you to the previous screen and back to the home-screen.



The home-screen shows just enough information without being overcrowded. The innovative Dial 'n Key makes programming a snap; just rotate the dial to the program you want, and then press it to open the program.

Here's a rundown of the 7C's programming:

BASIC MENU FUNCTIONS

- **Model select (MODEL).** This includes the sub menu for selecting the model (1 through 10), copying programs and naming the model. For the model name, you can use up to six characters: upper- and lower-case letters and symbols.
- **Dual rates and exponential (D/R, EXP).** Allows you to set the rates on channels 1 through 4 and select which switch you want to use.
- **Endpoint (E.POINT).** This is where each channel's travel can be adjusted and each direction can be set independently.
- **Subtrim (SUB-TRIM).** Available for all channels.
- **Servo-reverse (REVERSE).** Available for all channels.
- **Trim rate (TRIM).** Because the 7C uses digital trims, you can set the rate at which the trim lever reacts (small or large steps). In HELI mode, offset is available in the idle ups. If offset is inhibited, the trim levers will adjust the trims for all flight conditions (idle ups). If offset is active, then the trim lever will affect only the flight condition that's active.
- **Throttle cut (TH-CUT).** This allows you to kill the engine with a flick of a switch so you can set the digital throttle trim lever and forget it.
- **Fail-safe (FAIL SAFE).** This feature instructs the PCM receiver what to do if interference is received. You can set each channel independently to hold its last command or move each servo to a predetermined position.
- **Parameters (PARAMETER).** Resets all data to the factory default settings, selects ACRO and HELI programming as well as modulation (PPM/PCM).
- **Timer (TIMER).** Sets an internal timer that counts up or down; activate it with any switch.
- **Trainer (TRAINER).** When the trainer function is active, you can allow the student complete control or control of certain channels.

ADVANCED MENU FUNCTIONS

- **Free program mixers (P-MIX1, 2 and 3).** The 7C contains three programmable mixes that allow you to combine any 2 channels and define which switch to activate the mix.
- **Flaperons (FLAPRN).** Allows the ailerons to be used as flaps.
- **Flap trim (FL-TRIM).** Allows the ailerons to be trimmed as flaps during flight.
- **Airbrake (A.BRAKE).** A preprogrammed mix that simultaneously moves the flap and elevators.
- **Elevator-flap (ELE-FLP).** A preprogrammed mix that raises or drops the flaps whenever the elevator is moved; mostly used for fun-fly aerobatics.
- **Flap-elevator (FLP-ELE).** A preprogrammed linear mix that makes the elevator lower whenever the flaps are lowered.
- **V-tail (V-TAIL).** A mix that combines both elevator and rudder for a V-tail configuration.
- **Elevon (ELEVON).** A mix that allows aileron and elevator control of the same control surfaces. Used in deltas and tailless configurations.
- **Aileron-rudder (AIL-RUD).** A preprogrammed linear mix that combines aileron and rudder together; used primarily for coordinated turns.
- **Snap roll (SNAP).** A mix that allows snap rolls by flipping a switch.

HELICOPTER HIGHLIGHTS

In helicopter programming, the 7C supports normal, single-servo mechanical format and several forms of CCPM mixing. The only system that isn't supported is 4-servo (90-degree) CCPM. There are two idle ups with separate 5-point throttle and pitch curves. The HELI programming follows the same format as ACRO's with basic and advanced menus; those are accessed in the same way. Other features of the HELI programming include gyro programming, separate trims for each idle up and a delay function for smooth transitions in and out of idle up. The biggest fault I could find in the programming is that the radio has only one rotary knob for both the hovering-pitch and hovering-throttle adjustments. You have to switch back and forth in the programming between the two to fine-tune

specifications

MODEL: T7CAP/7CHP

MANUFACTURER: Futaba

TYPE: 7-channel PPM/PCM 1024 computer radio

TRANSMITTER: LCD panel with four buttons and a turn-and-press dial for data entry; airplane and helicopter programming; digital trim levers; 9.6V, 600mAh battery; PPM/PCM modulation

RECEIVER: 8-channel R138DP PCM dual conversion; 2.56x1.42x0.85 in.; 1.42 oz.

SERVOS: S3151 standard digital; 1.9x0.79x1.42 in.; 1.48 oz.; 43 oz.-in. torque; 0.21 sec./60 at 4.8V (7CAF FM comes w/4 S3004 servos)

ACCESSORIES: switch harness with charging jack; 4-cell, 600mAh Ni-Cd airborne battery pack; dual-output battery charger; neck strap; servo-mounting hardware, output arms and servo tray; frequency flag; instruction manual

PRICE: $249.99 to $349.99 (depending on options)

FEATURES: 10-model memory; 6-character model naming; Dial 'n Key programming; airplane and helicopter programming; digital servos; basic and advanced programming menus; fail-safe (PCM mode only); throttle cut; dual rates on 4 channels; triple rates available; no backup battery to service; user manual.

COMMENTS: the Futaba 7C is a sharp-looking radio that comes with all the features you would expect in a midlevel programmable radio. It has exceptional features and the flexibility of its older brother, the 9C, except at a lower cost.

HITS

- Easy to program.
- Easy-to-navigate menus.
- Includes digital servos.
- User-friendly manual.

MISSES

- Timer setup can erase aileron travel values.
- Dual-servo trim not supported by programmable mixes.

either. The programming memorizes the knob's last setting so the knob can be returned to its center point. This is good for multiple models. All in all, the 7C is a great entry to midlevel heli radio for those who are looking for an inexpensive heli system.

LIVING WITH THE 7C

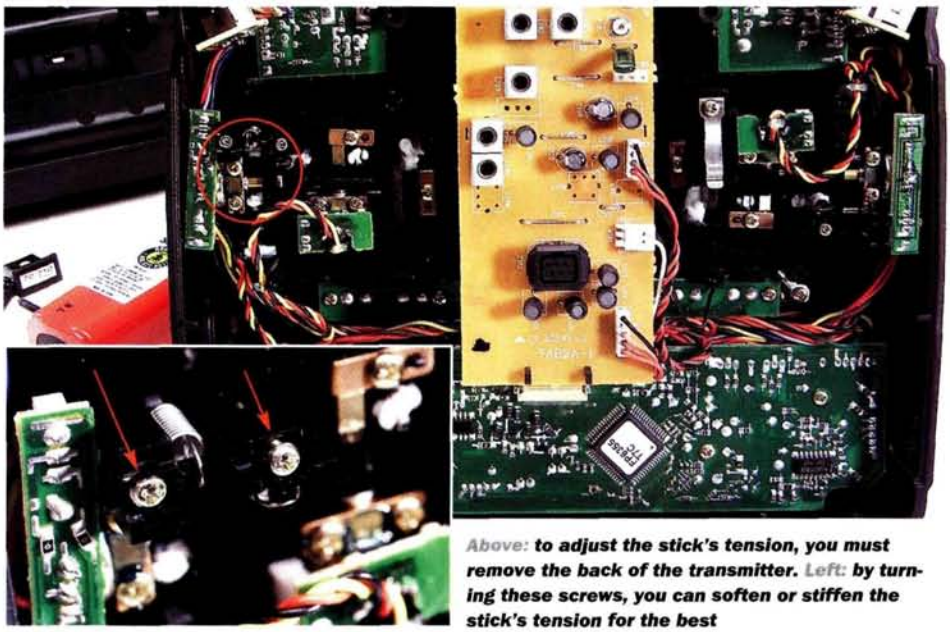
I gave the radio a thorough workout on my workbench and played with all of the programming functions. By bench-running through the programming, you'll quickly learn how to use the radio and will see how well the instruction manual is written. Overall, programming the 7C is easy and intuitive, both in ACRO and in HELI modes. The manual shows programming examples for all functions in a step-by-step format as well as which buttons to push and dials to rotate to achieve the desired result. The preprogrammed mixes need only to be activated and have percentages input to put them in use. A problem that I did find is that if you set up the timer to be activated by the throttle stick, when you press and hold down the scrolling dial, the travel values of channel 1 (aileron) can reset to a zero value. So if you use the timer function, it's very important that you check your ailerons before each flight to ensure that they work properly.

Another issue in ACRO programming is the lack of trim support when using dual-elevator or rudder servos. The programmable mixes don't include a link that will move both servos if you use the trim lever. For example, if you use P-MIX1 for 2 elevator servos and then use the elevator-trim lever, only the servo that's plugged into the receiver's elevator port will move. The second elevator servo will not follow the trim lever. This condition will produce a rolling movement every time you use the elevator. This is not a flaw of the radio; Futaba chose not to include the link in the 7C's programming because most modelers would use a Y-harness to run dual servos. These are not problems to be concerned about but, rather, items to be aware of.

I passed the 7C to Rodney Roy while he was working on a review of the Great Planes ElectriFly DC-3 for the June/July 2004 issue of *Backyard Flyer*. This model uses a servo on each aileron, and they can be hooked up with a Y-harness or programmed with a mixer. In the DC-3's instruction manual, under the "Flight Characteristics" section, it states that the model has a tendency to yaw adversely. To reduce this, Rodney put the programming to work by using the flaperon mixing feature and highlighting AIL-2 within it. After that, he changed the default setting from channel 6 to channel 5 and plugged the second aileron servo into the channel-5 port on the receiver. Using the Dial 'n Key, he then dialed in the percentage of differential needed to make the ailerons move up more than down. The whole process took less than 3 minutes to accomplish and, as you can see, was very easy to do.

FINAL THOUGHTS

I really like using Futaba's newest addition to its radio lineup. The 7C is very easy to operate, and the instruction manual takes you from quick start-up examples through the advanced programming features. I consider the 7C a midlevel programmable radio that sport fliers can use to great advantage to get the most from their aircraft. Since it has 10 nameable model memories, you can use one transmitter for all your planes. Add to this that you get 4, S3151 digital servos with it, and you can see that this radio system is one heck of a value. ✈



***Above:** to adjust the stick's tension, you must remove the back of the transmitter. **Left:** by turning these screws, you can soften or stiffen the stick's tension for the best*

***Futaba;** distributed by Great Planes Model Distributors Co. (800) 682-8948; (217) 398-6300; futaba-rc.com.*

click trip MODELAIRPLANENEWS.COM FOR A PROGRAMMING EXAMPLE, CHECK OUT THE CLICK TRIP.

Classic Model Airplane News

by Matt Boyd

50 years ago ...

... our August 1954 cover beautifully illustrated the rapid pace of aeronautical development during the first 25 years of *Model Airplane News*. At the time of our first issue, the ghostly Boeing F4B bipe in the background was cutting edge, but by 1954, the McDonnell Demon in the foreground was the state of the art.

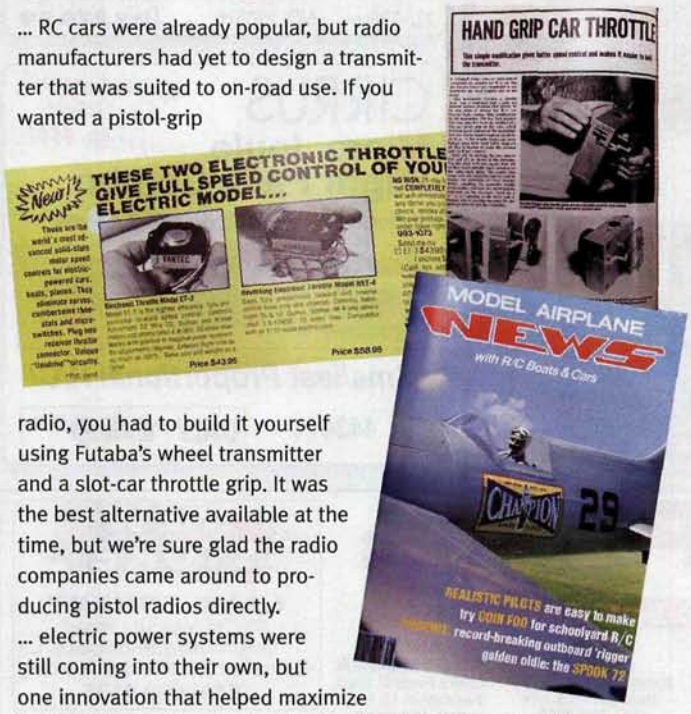
... with RC becoming more accessible, advanced model designs such as the Sea Cat became practical. A high-performance floatplane probably seemed oxymoronic at the time, but details like the NACA planing hull, a polyhedral wing and shock-mounted tip floats made it possible.

... built-up kits were the norm, but would you believe that ready-to-fly models were already a reality? Well, Cox clearly had an eye for the future, as its TD-3 came fully ready to go; its engine didn't even need to be broken in! The plane was small, too; with just a 17-inch span and weighing only 4¾ ounces, the TD-3 could probably be considered one of the first backyard RTFs!

25 years ago ...

... our cover story was Bill Hannan's step-by-step guide to personalizing pilot figures. His artistry can be seen in his likeness of Roscoe Turner onboard Bob Thacker's Laird-Turner Racer. In his text, he outlines the keys to reproduce a scale-detailed and historically accurate pilot figure for any era.

... RC cars were already popular, but radio manufacturers had yet to design a transmitter that was suited to on-road use. If you wanted a pistol-grip radio, you had to build it yourself using Futaba's wheel transmitter and a slot-car throttle grip. It was the best alternative available at the time, but we're sure glad the radio companies came around to producing pistol radios directly.



... electric power systems were still coming into their own, but one innovation that helped maximize their utility was the electronic speed control. ESCs offered fully proportional control and ratings up to 20A, but yikes—look at the size of those things! The ad touted them as being the same size and weight as a servo, but can you imagine lugging one of those around in your favorite electric plane today?

10 years ago ...

... Tom Hunt's Vertigo was our cover airplane for the August 1994 issue. We anointed it the first RC vertical takeoff and landing (VTOL) sport aircraft, as its O.S. .46 engine was mounted in a homemade "prop fan" nacelle that rotated 90 degrees from vertical to horizontal thrust.

... we examined the pros and cons of single versus multi-wing setups in "Biplane Secrets." From scale competition models to aerobatics, we explained the strengths of bipes and their design evolution.

... we showed the do-it-yourselfers who had access to lakeside flying sites how to build their own foam and fiberglass floats. The technique is easier than it sounds, and the results were light and strong and could be sized to fit a wide variety of models. Best of all, they looked better than store-bought floats for a fraction of the price.

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BACK ISSUES, MODEL MAGAZINES 61 Coach, Glastonbury, CT 06033-3237; davidbrown46@cox.net. [3/05]

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WANTED: any plans and/or magazine articles by Keith Laumer (circa '50s-'60s)—mostly F/F and U/C. Also, Jetco Krackerjack by Bill Winter and Jetco Luscombe Silvaire, if it was ever produced. Last, Aurora RTF U/C. Dr. Frank Lacobellis, 62 Pallisade Rd., Rye, NY 10580; (914) 967-5550. [8/04]

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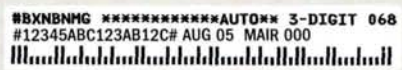

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PHOTOS BY TOM PIERCE

Peerless Dauntless

A builder's first attempt in giant-scale wins Best of Show

It came as no surprise to us that Tom Pierce won "Best of Show" at this year's Toledo Weak Signals RC Expo with his stunning SBD-5 Dauntless. What absolutely shocked us is that Tom reports that this is his first warbird, his first gas plane and his first giant-scale project! That he was able to achieve such success is a tribute to his meticulous preparation, thorough research and keen eye for detail—skills he honed competing in IPMS plastic scale modeling. Tom also credits the many experienced RC'ers who shared their advice and lent their support.

Tom started with a set of Jerry Bates plans for a 1/5.5-scale (17-percent), 85-inch SBD and laser-cut wood from All-American Kit Cutters. The plane is framed up over the plans and sheeted with balsa. The lower rear fuselage (the "belly" behind the trailing edge) had to be planked instead of sheeted because of its compound curves. Because Tom had constructed much of his plane before he chose the engine, he sheeted the plane only up to the cooling vents to allow access to the firewall area for engine and linkage installation (Tom finally selected a 3.2ci gas powerplant from First Place Engines). The tail gear moves with the rudder; and much attention was spent on its linkage and the fairing that covers the tailwheel assembly. Anticipating wear and tear from his grass field, Tom wanted the model's fairing to be removable (like the full-size version's) for easier repairs down the road. He layered balsa sheeting of various thicknesses (touched up with putty) to get the right taper. He then fiberglassed it to add strength.

The scale details are what make this plane stand out. Of particular interest are its exhaust stacks; Tom first carved them out of foam blocks. He carved them in pairs, forming a foam half donut. He skewered each pair on music wire, and then coated it with layers of heavy fiberglass. He then cut the pair apart, melted out the foam with acetone, finished shaping them and painted them with hobby enamels and acrylics. Another notable feature is the dummy radial engine in the nose. It is a molded resin piece from Frank Tiano Enterprises; it's heavy at 12 ounces, but it did double duty as nose weight. Tom made the lifter tubes out of styrene rod.

Some of the most impressive work can be seen in the SBD's cockpit. Tom made his instrument panels in four laminated layers. He created their templates on the computer and then had the pieces laser-cut out of Plexiglas, plywood and clear styrene. The gauges themselves are mostly from J'Tec's panel print set, with various others mixed in. The knobs, dials and rings are shaped out of styrene stock; the lone switch is a carved piece of solder.

This only touches on the incredible work that went into Tom's Dauntless (not to mention the pilot figures that crew this exceptional model). Luckily, he recounts much of the amazing effort on his website (http://renderwurx.com) devoted to the project. Besides researching the full-scale subject ("41 Sniper") and its crew and assembling, painting and detailing the model, Tom put more work into the website presentation of his plane than many do on their models. It's a fascinating read and well illustrates how an organized approach, diligence and creativity can produce an award-winning model, even your first time out. Way to go, Tom!